



IMPERIAL AGRICULTURAL
RESEARCH INSTITUTE, NEW DELHI.

GIPC—S4—III-1 93—22 8-45—5 000.

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH ADMINISTRATION
OFFICE OF EXPERIMENT STATIONS

EXPERIMENT STATION RECORD

VOLUME 87

JULY-DECEMBER 1942



UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1943

U. S. DEPARTMENT OF AGRICULTURE

SECRETARY—Claude R. Wickard

AGRICULTURAL RESEARCH ADMINISTRATION

ADMINISTRATOR—E. C. Auchter

OFFICE OF EXPERIMENT STATIONS

CHIEF—James T. Jardine

ASSISTANT CHIEF—R. W. Trullinger

THE AGRICULTURAL EXPERIMENT STATIONS

ALABAMA—*Auburn*: M. J. Funchess.¹

ALASKA—*College*: L. T. Oldroyd.¹

ARIZONA—*Tucson*: P. S. Burgess.¹

ARKANSAS—*Fayetteville*: C. O. Brannen.¹

CALIFORNIA—*Berkeley*: C. B. Hutchison.¹

COLORADO—*Fort Collins*: H. J. Henney.¹

CONNECTICUT—

[New Haven] Station: *New Haven*; W. L. Slate.¹

Storrs Station: *Storrs*; E. G. Woodward.¹

DELAWARE—*Newark*: G. L. Schuster.¹

FLORIDA—*Gainesville*: W. Newell.¹

GEORGIA—

Experiment: H. P. Stuckey.¹

Coastal Plain Station: *Tifton*; G. H. King.¹

HAWAII—*Honolulu*: J. H. Beaumont.¹

IDAHO—*Moscow*: E. J. Iddings.¹

ILLINOIS—*Urbana*: H. P. Rusk.¹

INDIANA—*La Fayette*: H. J. Reed.¹

IOWA—*Ames*: R. E. Buchanan.¹

KANSAS—*Manhattan*: L. E. Call.¹

KENTUCKY—*Lexington*: T. P. Cooper.¹

LOUISIANA—*University Station, Baton Rouge*: W. G. Taggart.¹

MAINE—*Orono*: F. Griffee.¹

MARYLAND—*College Park*: R. B. Corbett.¹

MASSACHUSETTS—*Amherst*: F. J. Sievers.¹

MICHIGAN—*East Lansing*: V. R. Gardner.¹

MINNESOTA—*University Farm, St. Paul*: C. H. Bailey.¹

MISSISSIPPI—*State College*: C. Dorman.¹

MISSOURI—

College Station: *Columbia*; M. F. Miller.¹

Fruit Station: *Mountain Grove*; P. H. Shepard.¹

Poultry Station: *Mountain Grove*; T. W. Noland.¹

MONTANA—*Boseman*: C. McKee.¹

¹ Director.

NEBRASKA—*Lincoln*: W. W. Burr.¹

NEVADA—*Reno*: S. B. Doten.¹

NEW HAMPSHIRE—*Durham*: M. G. Eastman.¹

NEW JERSEY—*New Brunswick*: W. H. Martin.¹

NEW MEXICO—*State College*: Fabian Garcia.¹

NEW YORK—

State Station: *Geneva*; A. J. Heinicke.¹

Cornell Station: *Ithaca*; C. E. F. Guter-
man.¹

NORTH CAROLINA—*State College Station, Ra-*
leigh; L. D. Bayer.¹

NORTH DAKOTA—*State College Station, Fargo*:
H. L. Walster.¹

OHIO—*Wooster*: Edmund Secrest.¹

OKLAHOMA—*Stillwater*: W. L. Blizzard.¹

OREGON—*Corvallis*: W. A. Schoenfeld.¹

PENNSYLVANIA—*State College*: F. F. Lininger.¹

PUERTO RICO—

Federal Station: *Mayaguez*; K. A. Bart-
lett.¹

Insular Station: *Rio Piedras*; Arturo
Rogue.¹

RHODE ISLAND—*Kingston*: M. H. Campbell.¹

SOUTH CAROLINA—*Clemson*: H. P. Cooper.¹

SOUTH DAKOTA—*Brookings*: I. B. Johnson.¹

TENNESSEE—*Knoxville*: C. A. Moores.¹

TEXAS—*College Station*: A. B. Conner.¹

UTAH—*Logan*: R. H. Walker.¹

VERMONT—*Burlington*: J. E. Carrigan.¹

VIRGINIA—

Blacksburg: A. W. Drinkard, Jr.¹

Truck Station: *Norfolk*; H. H. Zimmer-
ley.¹

WASHINGTON—

College Station: *Pullman*; E. C. Johnson.¹

Western Station: *Puyallup*; J. W. Kal-
kus.¹

WEST VIRGINIA—*Morgantown*: C. R. Orton.¹

WISCONSIN—*Madison*: C. L. Christensen.¹

WYOMING—*Laramie*: J. A. Hill.¹

¹ Superintendent.

EXPERIMENT STATION RECORD

EDITOR: HOWARD LAWTON KNIGHT

EDITORIAL DEPARTMENTS

Agricultural and Biological Chemistry—H. C. WATERMAN, GEORGIAN ADAMS.
Agricultural Meteorology—F. V. RAND.
Soils and Fertilizers—H. C. KNORLAUCH, H. C. WATERMAN.
Agricultural Botany, Diseases of Plants—H. P. BARSS, F. V. RAND.
Genetics—G. HAINES, H. M. STEECE, J. W. WELLINGTON.
Field Crops—H. M. STEECE.
Horticulture and Forestry—J. W. WELLINGTON.
Economic Zoology and Entomology—W. A. HOOKER, F. ANDRE.
Animal Husbandry—G. HAINES.
Dairying and Dairy Farming—E. C. ELTING.
Veterinary Medicine—W. A. HOOKER.
Agricultural Engineering—H. C. WATERMAN.
Agricultural Economics—F. G. HARDEN, B. YOUNGBLOOD.
Rural Sociology—B. YOUNGBLOOD, F. G. HARDEN.
Agricultural and Home Economics Education—F. G. HARDEN.
Foods and Human Nutrition, Home Management and Equipment—SYBIL L. SMITH, GEORGIAN ADAMS.
Textiles and Clothing—GEORGIAN ADAMS, H. M. STEECE.
Indexes—MARTHA C. GUNDLACH.
Bibliographies—CORA L. FELDKAMP.
Cooperation with *Biological Abstracts*.—F. V. RAND.

CONTENTS OF VOLUME 87

EDITORIALS

	Page
Some significant findings of the experiment stations in 1941 (Part 1)-----	1
Some significant findings of the experiment stations in 1941 (Part 2)-----	161
Plant science research institutions and personnel in Central and South America -----	825
Dr. Henry Granger Knight, a dynamic research director-----	469
The agricultural experiment stations in 1941-----	618
Research at the Second Inter-American Conference of Agriculture-----	757

STATION PUBLICATIONS ABSTRACTED

ALABAMA STATION :	Page	CALIFORNIA STATION—Continued.	Page
Bulletin 252.....	754	Mimeographed Report 80.....	876
Bulletin 253.....	666	Forecast of Seasonal Labor	
Bulletin 254.....	694	Requirements for California Crops, 1942.....	868
Bulletin 255.....	740	Important Sources of Information for Work in Agricultural Economics.....	283
Circular 85.....	803		
ALABAMA TUSKEGEE STATION :		COLORADO STATION :	
Bulletin 43.....	589	Bulletin 469.....	507
ARIZONA STATION :		Bulletin 470.....	511
Bulletin 175.....	438	Bulletin 471.....	519
Bulletin 176.....	135	Bulletin 472.....	511
Bulletin 177.....	102	Technical Bulletin 28.....	217
Bulletin 178.....	130	Colorado Farm Bulletin, vol. 4—	
Bulletin 179.....	438	No. 1, Jan.—Mar. 1942....	188,
Bulletin 180.....	443	214, 238, 258, 304	
Bulletin 181.....	509	No. 2, Apr.—June 1942....	631,
Bulletin 182.....	635	642, 662, 665, 667, 669, 686,	
Bulletin 183.....	869	691, 740.	
Bulletin 184.....	701	No. 3, July—Sept. 1942....	774,
Technical Bulletin 93.....	827	798, 801, 834, 835, 838, 851,	
Annual Report 1941.....	760,	855, 884.	
768, 776, 788, 791, 798, 805, 819,			
835, 841, 850, 859, 866, 880, 899			
ARKANSAS STATION :		CONNECTICUT [NEW HAVEN] STATION :	
Bulletin 415.....	252	Bulletin 449.....	575
Bulletin 416.....	303	Bulletin 450.....	26
Bulletin 418.....	664	Bulletin 451.....	230
CALIFORNIA STATION :		Bulletin 452 (Annual Report	
Bulletin 658.....	65	1941).....	760, 768, 791,
Bulletin 659.....	511	799, 803, 805, 822, 860, 899	
Bulletin 660.....	91	Bulletin 453.....	30
Bulletin 661.....	407	Bulletin 454.....	376
Bulletin 662.....	413	Bulletin 455.....	231
Bulletin 663.....	661,	Bulletin 456.....	688
694, 698, 732, 755		Bulletin 457.....	796, 813, 822
Bulletin 664.....	580	Bulletin 458.....	774
Bulletin 665.....	692		
Bulletin 666.....	581	[CONNECTICUT] STORRS STATION :	
Bulletin 667.....	518	Bulletins 237—239.....	872
Circular 298 (rev.).....	440		
Circular 351.....	729	DELAWARE STATION :	
Hilgardia, vol. 14—		Bulletin 233.....	436
No. 5, Jan. 1942.....	442	Bulletin 234.....	17
No. 6, Feb. 1942.....	339	Bulletin 235 (Annual Report	
No. 7, May 1942.....	674	1941).....	165, 212, 220,
Mimeographed Report 77....	442	227, 245, 260, 283, 322	
Mimeographed Report 78....	441	Bulletin 236.....	816
Mimeographed Report 79....	876		

FLORIDA STATION:	Page	INDIANA STATION—Continued.	Page
Bulletin 364.....	372	Bulletin 466.....	730
Bulletin 368.....	328	Bulletin 467.....	588
Bulletin 369.....	372	Circular 267.....	370
Bulletin 370.....	823	Circular 268.....	414
Bulletin 371.....	808	Circular 269.....	344
Annual Report 1941.....	760,	Annual Report 1941.....	616,
768, 787, 791, 799, 806, 822, 833,		638, 649, 655, 659, 668, 676, 679,	
842, 850, 869, 880, 899.		694, 697, 704, 709, 725, 729, 740,	
		754.	
GEORGIA STATION:		IOWA STATION:	
Bulletin 219.....	375	Research Bulletin 294.....	56
Bulletin 220.....	868	Research Bulletin 295.....	673
Circular 132.....	64	Research Bulletin 296.....	681
Circular 133.....	5	Research Bulletin 297.....	898
Circular 134.....	216	Research Bulletin 299.....	837
Circular 135.....	132	Research Bulletin 301.....	849
Circular 136.....	235	Research Bulletin 302.....	766
Circular 137.....	770	Bulletin P27, new series....	445
Circular 138.....	836	Bulletin P34, new series....	302
HAWAII STATION:		Bulletin P35, new series....	132
Circular 19.....	701	Bulletin P36, new series....	135
Circular 20.....	701	Bulletin P37, new series....	133
IDAHO STATION:		Bulletin P38, new series....	215
Bulletin 243.....	437	Bulletin P39, new series....	222
Bulletin 244 (Annual Report		Bulletin P40, new series....	221
1941).....	616,	Bulletin P41, new series....	217
631, 632, 659, 671, 679, 694, 697,		Bulletin P42, new series....	373
703, 709, 724, 729, 739, 755.		Bulletin P43, new series....	820
Circular 84.....	517	Bulletin P44, new series....	863
Circular 85.....	664	Bulletin P45, new series....	642
ILLINOIS STATION:		Bulletin P46, new series....	885
Bulletin 482.....	53	Bulletin P47, new series....	837
Bulletin 483.....	55	Annual Report 1941, parts 1	
Bulletin 484.....	640	and 2.....	165,
Bulletin 485.....	368	182, 183, 191, 208, 209, 212, 214,	
Bulletin 486.....	869	220, 226, 227, 245, 247, 256, 263,	
Bulletin 487.....	514	270, 277, 283, 300, 302, 303, 321,	
Bulletin 488.....	700	322.	
Bulletin 489.....	788	KANSAS STATION:	
Annual Report 1938.....	482,	Bulletin 209.....	663
503, 514, 516, 523, 528, 545, 554,		Circular 209.....	305
562, 564, 573, 583, 587, 588, 608,		Circular 210.....	217
609.		Agricultural Economics—	
INDIANA STATION:		Report 1.....	295
Bulletin 461.....	180	Report 3.....	292
Bulletin 462.....	291	Report 5.....	299
Bulletin 463.....	291	KENTUCKY STATION:	
Bulletin 464.....	287	Bulletin 418.....	133
Bulletin 465.....	415	Bulletin 419.....	130
		Bulletin 420.....	345

KENTUCKY STATION—Continued.

	Page
Bulletin 421.....	438
Bulletin 422.....	587
Bulletin 423.....	558
Bulletin 424.....	875
Bulletin 425.....	831
Bulletin 426.....	857
Circular 52.....	507
Regulatory Series Bulletin 27.....	100
Regulatory Series Bulletin 28.....	370
Regulatory Series Bulletin 29.....	60
Regulatory Series Bulletin 30.....	775
Annual Report 1941.....	764,
769, 792, 799, 806, 822, 834, 842,	
851, 866, 877, 884, 899.	

LOUISIANA STATION :

Bulletin 335.....	300
Bulletin 336.....	75
Bulletin 337.....	289
Bulletin 338.....	290
Bulletin 339.....	291
Bulletin 340.....	869
Bulletin 341.....	411
Bulletin 342.....	412
Bulletin 343.....	633
Bulletin 344.....	848
Bulletin 346.....	738
Bulletin 348.....	796
Bulletin 349.....	810

MAINE STATION :

Bulletin 405 (Report 1941).....	182,
183, 197, 213, 220, 228, 236, 248,	
264, 280, 302, 316, 322.	
Bulletin 408.....	436
Bulletin 409.....	693
Bulletin 410.....	685
Official Inspections 182.....	219, 221

MARYLAND STATION :

Bulletin 441.....	873
Bulletin A1.....	561
Bulletin A2.....	585
Bulletin A4.....	132
Bulletin A5.....	134

MASSACHUSETTS STATION :

Bulletin 886.....	301
Bulletin 887.....	292

MASSACHUSETTS STATION—Con.

	Page
Bulletin 388 (Annual Report 1941).....	760,
769, 775, 788, 792, 800, 806, 820,	
837, 842, 858, 859, 866, 880, 899	
Bulletin 389.....	733
Bulletin 390.....	605
Bulletin 391.....	721
Bulletin 392.....	803
Control Series Bulletin 111.....	870

MICHIGAN STATION :

Special Bulletin 315.....	734
Special Bulletin 316.....	879
Special Bulletin 317.....	874
Circular 179.....	62
Circular 180.....	217
Circular 181.....	223
Circular 182.....	435
Circular 183.....	578
Quarterly Bulletin, vol. 24—	

No. 3, Feb. 1942.....	168, 194,
198, 215, 223, 226, 245, 258,	
262, 264, 268, 301, 322.	

No. 4, May 1942.....	762,
764, 766, 767, 795, 801, 802,	
803, 804, 824, 831, 836, 848,	
850, 853, 875.	

Miscellaneous Publication,	
Handbook of Virus Dis-	
eases of Stone Fruits in	
North America.....	691
Annual Report 1941.....	755

MINNESOTA STATION :

Bulletin 358.....	445
Bulletin 359.....	732
Bulletin 360.....	704
Technical Bulletin 150.....	664

MISSISSIPPI STATION :

Bulletin 364.....	321
Bulletin 366.....	370
Bulletin 367.....	370
Bulletin 368.....	795
Technical Bulletin 29.....	216
Circular 103.....	235
Circular 104.....	238
Circular 105.....	382
Circular 106.....	728

Mississippi Farm Research,
vol. 5—

No. 2, Feb. 1942.....	26, 27,
59 52 59 60 128 150	

MISSISSIPPI STATION—Continued.		Page	MISSOURI STATION—Continued.		Page
No. 3, Mar. 1942	-----	189, 213,	Circular 227	-----	347
221, 256, 275, 284, 304, 321			Circular 228	-----	393
No. 4, Apr. 1942	-----	344,	Circular 229	-----	398
366, 370, 376, 381, 405, 412			Circular 230	-----	443
No. 5, May 1942	-----	632, 660,	Circular 231	-----	696
669, 671, 695, 699, 740, 741			Circular 232	-----	727
No. 6, June 1942	-----	632, 660,	Circular 233	-----	694
675, 681, 695, 700, 702, 704			Circular 234	-----	704
No. 7, July 1942	-----	774,	Circular 235	-----	627
795, 824, 835, 836, 840, 863,			Circular 236	-----	670
876, 887, 897.			Circular 237	-----	733
Annual Report 1941	-----	159	Circular 238	-----	815
			Circular 239	-----	834
MISSOURI STATION :			MONTANA STATION :		
Bulletin 437	-----	60	Bulletin 397	-----	360
Bulletin 438 (Annual Report			Bulletin 398	-----	431
1938)	-----	4,	Bulletin 399	-----	509
22, 32, 47, 52, 57, 67, 85, 98,			Bulletin 400	-----	556
103, 108, 120, 129, 145, 158, 159			Bulletin 401	-----	555
Bulletin 439	-----	54	Bulletin 402	-----	484
Bulletin 440	-----	213	Bulletin 403	-----	769
Bulletin 441	-----	261	Circular 166	-----	812
Bulletin 442	-----	227	NEBRASKA STATION :		
Bulletin 443	-----	732	Bulletin 336	-----	133
Bulletin 445	-----	666	Bulletin 337	-----	134
Bulletin 446	-----	748	Bulletin 338	-----	280
Bulletin 447	-----	717	Bulletin 339	-----	370
Bulletin 449	-----	775	Bulletin 340	-----	441
Research Bulletin 332	-----	101	Bulletin 341	-----	868
Research Bulletin 333	-----	147	Bulletin 342	-----	850
Research Bulletin 334	-----	141	Research Bulletin 123	-----	506
Research Bulletin 335	-----	265	Research Bulletin 124	-----	662
Research Bulletin 336	-----	207	Research Bulletin 125	-----	746
Research Bulletin 337	-----	207	Research Bulletin 126	-----	681
Research Bulletin 338	-----	210	Research Bulletin 127	-----	897
Research Bulletin 339	-----	417	NEVADA STATION :		
Research Bulletin 340	-----	417	Bulletin 156	-----	130
Research Bulletin 341	-----	359	Bulletin 157	-----	227
Research Bulletin 342	-----	410	Bulletin 158	-----	236
Research Bulletin 343	-----	839	Bulletin 159	-----	662
Research Bulletin 344	-----	794	Bulletin 160	-----	795
Research Bulletin 345	-----	769	Bulletin 161	-----	835
Circular 217	-----	727	Farm Management Bulletin—		
Circular 218	-----	189	Vol. 1—		
Circular 219	-----	433	No. 2, Aug. 1940	-----	286
Circular 220	-----	393	No. 3, Sept. 1940	-----	286
Circular 221	-----	375	No. 4, Oct. 1940	-----	286
Circular 222	-----	393	Vol. 2—		
Circular 223	-----	376	No. 1, June 1941	-----	286
Circular 224	-----	393	No. 2, Aug. 1941	-----	286
Circular 225	-----	406	Annual Report 1941	-----	899
Circular 226	-----	393			

NEW HAMPSHIRE STATION :		NEW MEXICO STATION :	
	Page		Page
Bulletin 334.....	55	Bulletin 285.....	437
Bulletin 336.....	347	Bulletin 286.....	102
Scientific Contribution 80.....	421	Bulletin 287.....	100
Scientific Contribution 81.....	344	Bulletin 288.....	248
		Bulletin 289.....	368
NEW JERSEY STATIONS :		Bulletin 290.....	683
Bulletin 691.....	63	Bulletin 291.....	507
Bulletin 692.....	368	Bulletin 292.....	635
Bulletin 693.....	695	Bulletin 294.....	801
Bulletin 694.....	669	Annual Report 1941.....	327,
Bulletin 695.....	704	343, 360, 366, 371, 378, 393, 403,	
Circular 418.....	706	411, 428, 434, 446, 465.	
Circular 419.....	369	[NEW YORK] CORNELL STATION :	
Circular 420.....	347	Bulletin 770.....	94
Circular 421.....	551	Bulletin 771.....	104
Circular 422.....	483	Bulletin 773.....	134
Circular 423.....	376	Bulletin 774.....	137
Circular 424.....	696	Bulletin 775.....	445
Circular 425.....	483	Bulletin 776.....	507
Circular 426.....	696	Bulletin 777.....	483
Circular 427.....	369	Bulletin 778.....	537
Circular 428.....	669	Bulletin 779.....	585
Circular 429.....	508	Memoir 240.....	94
Circular 430.....	815	Memoir 241.....	373
Circular 431.....	815	Memoir 242.....	876
Circular 432.....	815	Memoir 243.....	846
Circular 433.....	658	Memoir 244.....	722
Circular 434.....	541	Annual Report 1941.....	4,
Circular 435.....	639	23, 32, 47, 53, 57, 60, 64, 65, 67,	
Circular 436.....	520	90, 99, 103, 109, 120, 129, 136.	
Circular 437.....	686	NEW YORK STATE STATION :	
Circular 438.....	813	Bulletin 699.....	180
Circular 439.....	563	Bulletin 700.....	58
Circular 440.....	660	Bulletin 701.....	374
Circular 443.....	669	Technical Bulletin 262.....	450
Hints to Poultrymen, vol.		Technical Bulletin 263.....	848
29—		Circular 140 (rev.).....	402
No. 2, Dec. 1941-Jan.		Circular 153 (rev.).....	520
1942.....	427	Circular 161 (rev.).....	402
No. 3, Feb.-Mar. 1942.....	408	Circular 189 (rev.).....	802
No. 4, Apr.-May 1942.....	701	Circular 193.....	376
Nursery Disease Notes, vol.		Farm Research, vol. 8—	
14—		No. 2, Apr. 1, 1942.....	222,
No. 9, Mar. 1942.....	817	223, 224, 226, 256, 270, 305	
No. 10, Apr. 1942.....	810	No. 3, July 1, 1942.....	773,
No. 11, May 1942.....	818	775, 798, 801, 802, 815, 831,	
No. 12, June 1942.....	818	842, 845, 899.	
Plant Disease Notes, vol. 19,		NORTH CAROLINA STATION :	
No. 12, Mar. 1942.....	815	Bulletin 331.....	344
Annual Report 1941.....	342,	Technical Bulletin 68.....	706
366, 371, 377, 391, 392, 403, 418,		AE-RS Information Series 8.....	438
428, 434, 465, 769.			

NORTH DAKOTA STATION :

	Page
Bulletin 308.....	699
Bulletin 309.....	695
Bulletin 310.....	669
Bulletin 311.....	512
Bulletin 312.....	867
Bulletin 313.....	820
Bulletin 314.....	871
Bulletin 315.....	635
Bulletin 316.....	788
Bulletin 317.....	841
Bulletin 318.....	836
Bimonthly Bulletin, vol. 4—	
No. 3, Jan. 1942.....	55,
57, 75, 95, 126, 135	
No. 4, Mar. 1942.....	188,
195, 197, 215, 216, 217, 219,	
222, 248, 273, 284.	
No. 5, May 1942.....	627,
667, 686, 696, 700, 702, 707,	
708, 719.	
No. 6, July 1942.....	832, 877

OHIO STATION :

Bulletin 625.....	298
Bulletin 626.....	63
Bulletin 627.....	516
Bulletin 628.....	868
Bulletin 629.....	801
Bulletin 630.....	817
Bimonthly Bulletin 214.....	178,
203, 239, 260, 284, 306	
Bimonthly Bulletin 215.....	482,
510, 515, 518, 551, 559, 584, 586	
Bimonthly Bulletin 216.....	517, 581
Special Circular 64.....	369

OKLAHOMA STATION :

Bulletin 252.....	101
Bulletin 253.....	127
Bulletin 254.....	102
Bulletin 255.....	700
Bulletin 256.....	677
Bulletin 257.....	638
Bulletin 258.....	665
Technical Bulletin 12.....	617
Technical Bulletin 13.....	673
Circular 96.....	248
Circular 97.....	344
Circular 98.....	222
Circular 99.....	219
Circular 100.....	749
Circular 101.....	704

OKLAHOMA STATION—Continued.

	Page
Circular 102.....	666
Circular 103.....	674
Circular 104.....	664
Miscellaneous Publication 3.....	370
Miscellaneous Publication 4.....	369
Miscellaneous Publication 5.....	373
Miscellaneous Publication 6.....	511
Miscellaneous Publication 7.....	741
Current Farm Economics,	
vol. 15—	
No. 1, Feb. 1942.....	130
No. 2, Apr. 1942.....	435
No. 3, June 1942.....	730
No. 4, Aug. 1942.....	866

OREGON STATION :

Bulletin 397.....	849
Bulletin 398.....	842
Bulletin 399.....	865
Bulletin 402.....	856
Bulletin 403.....	798
Bulletin 404.....	860
Bulletin 405.....	859
Bulletin 407.....	878
Bulletin 408.....	854

PENNSYLVANIA STATION :

Bulletin 414 (Annual Report	
1941).....	479,
482, 504, 513, 524, 528, 546,	
554, 562, 569, 573, 584, 586,	
589, 607, 609.	
Bulletin 415.....	99
Bulletin 416.....	102
Bulletin 417.....	300
Bulletin 418.....	644
Bulletin 419.....	824
Bulletin 420.....	824
Bulletin 421.....	437
Bulletin 422.....	686
Bulletin 423.....	641
Bulletin 424.....	842
Bulletin 425.....	837
Bulletin 426.....	803
Bulletin 427.....	836

PUERTO RICO STATION :

Bulletin 40.....	255
Bulletin 41.....	96
Report 1939 (Spanish ed.).....	322
Report 1940.....	618,
646, 666, 668, 679, 694, 725, 755	

PUERTO RICO UNIVERSITY STATION :		Page	TENNESSEE STATION :		Page
Mimeographed Report 17	(Spanish ed.)	290	Bulletin 118		699
Mimeographed Report 18	(Spanish ed.)	294	Bulletin 179		728
Mimeographed Report 19		25	Bulletin 180		701
Mimeographed Report 20,	Supplements 1 and 2	293	Circular 79		663
Agricultura Experimental—			Circular 80		666
Vol. 1, No. 6, Nov.-Dec.			Agricultural Economics and		
1941		373, 465	Rural Sociology Depart-		
Vol. 2—			ment—		
No. 1, Jan.-Feb.			Monograph 109 (rev.)		286
1942		407, 408, 435, 140	Monograph 130		289
No. 2, Mar.-Apr.			Monograph 133		290
1942		815, 870, 871, 876	Monograph 134		294
No. 3, May-June			Monograph 135		444
1942		761, 800, 824, 858	Annual Report 1940		327,
Journal of Agriculture of the			342, 360, 367, 371, 378, 393, 404,		
University of Puerto Rico,			411, 428, 446, 464.		
vol. 25, No. 4, Oct. 1941		376,			
386, 391, 394, 400					
Annual Report 1941		165, 183,			
213, 221, 229, 248, 270, 284, 323					
RHODE ISLAND STATION :			TEXAS STATION :		
Annual Fertilizer Circular,			Bulletin 606		132
1942		643	Bulletin 608		405
SOUTH CAROLINA STATION :			Bulletin 609		376
Bulletin 339		301	Bulletin 610		372
Bulletin 340		287	Bulletin 611		565
Bulletin 341		608	Bulletin 612		804
Circular 61		441	Circular 94		272
Annual Report 1941		338,	Circular 95		225
342, 366, 371, 378, 393, 403, 411,			Circular 96		854, 899
422, 428, 435, 445, 451, 455, 465					
SOUTH DAKOTA STATION :			UTAH STATION :		
Bulletin 355		439	Bulletin 301		733
Bulletin 356		444	Farm and Home Science, vol.		
Bulletin 357		444	3—		
Bulletin 358		412	No. 1, Mar. 1942		219, 221,
Bulletin 359		737	223, 239, 250, 272, 323		
Bulletin 360		873	No. 2, June 1942		626, 676,
Circular 36		438	696, 713, 726, 727, 733, 741		
Circular 37		876			
Circular 38		703			
Circular 39		737			
Circular 40		695			
Annual Report 1941		483,			
504, 513, 528, 546, 554, 563, 564,					
573, 590, 608, 609.					
			VERMONT STATION :		
			Bulletin 478		834
			Bulletin 479		871
			Bulletin 480		871
			Bulletin 481		563
			Bulletin 482		563
			Bulletin 483		638
			Bulletin 484		660
			Bulletin 485		843
			Bulletin 486		442
			VIRGINIA STATION :		
			Bulletin 337		484
			Bulletin 338		534

VIRGINIA STATION—Continued.

Bulletin 339.....	793
Technical Bulletin 79.....	824
Rural Sociology Report 18.....	302
Rural Sociology Report 21.....	737

WASHINGTON STATION:

Bulletin 408.....	458
Bulletin 409.....	436
Bulletin 410 (Annual Report 1941).....	327,
343, 367, 372, 378, 393, 404, 411, 418, 428, 435, 447, 451, 465	843
Bulletin 411.....	843
Bulletin 412.....	640
Bulletin 413.....	835
Popular Bulletin 161.....	139
Popular Bulletin 162.....	62
Popular Bulletin 163.....	158
Popular Bulletin 164.....	92
Popular Bulletin 165.....	346
Popular Bulletin 166.....	369

WEST VIRGINIA STATION:

Bulletin 303.....	484
Bulletin 304.....	731
Circular 77.....	236

WISCONSIN STATION:

Bulletin 424 (rev.).....	235
Bulletin 454.....	259
Bulletin 455 (Annual Report 1941, part 2).....	483, 504, 513, 524, 528, 546, 554, 574, 609
Research Bulletin 141.....	218
Research Bulletin 142.....	184
Research Bulletin 143.....	293
Research Bulletin 144.....	801

WYOMING STATION:

Bulletin 249.....	273
Bulletin 250.....	373
Bulletin 251.....	508
Bulletin 252.....	692
Bulletin 253.....	794
Annual Report 1941.....	768, 788, 793, 800, 822, 834, 842, 851, 867, 880, 899.

UNITED STATES DEPARTMENT OF AGRICULTURE
PUBLICATIONS ABSTRACTED

Technical Bulletin—

785.....	83
787.....	510
792.....	374
793.....	249
795.....	667
797.....	190
798.....	243
799.....	76
804.....	128
806.....	340
807.....	84
808.....	764
810.....	682
811.....	651
812.....	290
813.....	770
814.....	442
817.....	340
818.....	505
821.....	449
823.....	550
824.....	577
827.....	844

Farmers' Bulletin—

685 (rev.).....	675
1027 (rev.).....	224
1399 (rev.).....	519
1507 (rev.).....	408
1563 (rev.).....	515
1683 (rev.).....	277
1741 (rev.).....	369
1747 (rev.).....	360
1831 (rev.).....	608
1862 (rev.).....	238
1882.....	224
1886.....	398
1895.....	391
1896.....	803
1897.....	516
1898.....	676
1899.....	306
1900.....	793
1901.....	373
1902.....	511
1903.....	795
1905.....	897
1908.....	881
1910.....	795

Circular—	Page	Miscellaneous Publication—Con.	Page
614.....	112	483.....	58
616.....	254	486.....	639
623.....	214	487.....	846
624.....	191	435
628.....			
630.....		Series No.	
632.....	91	302
633.....	523	Hydrologic Bulletin 2.....	632
634.....	797	Hydrologic Bulletin 3.....	632
635.....	823	Inventory 130.....	484
636.....	86	Statistics and Agriculture No. 1.....	283
637.....	864	Statistics and Agriculture No. 2.....	289
638.....	891	Crops and Markets, vol. 19—	
639.....	394	No. 1, Jan. 1942.....	299
640.....	692	No. 2, Feb. 1942.....	299
641.....	227	No. 3, Mar. 1942.....	444
642.....	258	No. 4, Apr. 1942.....	586
644.....	440	Agricultural Planning in a World	
645.....	591	at War.....	285
646.....	509	Index-Catalogue of Medical and	
647.....	832	Veterinary Zoology, part 6,	
648.....	373	G to Gyscr.....	850
Leaflet—		List of Farmers' Bulletins That	
214.....	430	Have Been Superseded and the	
215.....	506	Farmers' Bulletins or Other	
216.....	581	Publications Superseding Them.....	899
217.....	863	The Publications of the United	
218.....	516	States Department of Agriculture	
219.....	516	and the Policies Covering	
220.....	514	Their Distribution.....	159
221.....	670	OFFICE OF EXPERIMENT STATIONS:	
222.....	670	Report on the Agricultural	
224.....	670	Experiment Stations, 1941.....	755
Miscellaneous Publication—		EXTENSION SERVICE:	
418.....	292	Security at the Grass Roots:	
422.....	158	A Report of Cooperative	
423.....	347	Extension Work in Agriculture	
437.....	370	and Home Economics, 1940-41.....	136
452.....	136	LIBRARY:	
455.....	159	Library List 1, Selected List	
456.....	897	of American Agricultural	
457.....	159	Books.....	880
462.....	608	Library List 2, Farm Tenancy	
464.....	158	in the United States, 1940-1941:	
465.....	321	A Selected List	
466.....	92	of References.....	585
471.....	20		
473.....	26		
478.....	438		
479.....	587		
480.....	880		

AGRICULTURAL ADJUSTMENT ADMINISTRATION:

	Page
G-96, Agricultural Adjustment, 1939	292
G-104, Agricultural Adjustment, 1939-40	292
G-113, Report of the Administrator of the Agricultural Adjustment Administration, 1941	292
Compilation of Soil Conservation and Domestic Allotment Act, as Amended, Agricultural Adjustment Act of 1938, as Amended, Federal Crop Insurance Act, as Amended, Sugar Act of 1937, as Amended, Laws and Executive Orders Concerning the Commodity Credit Corporation, Related Appropriation Items, and Miscellaneous Laws, January 2, 1942	437

BUREAU OF AGRICULTURAL CHEMISTRY AND ENGINEERING:

ACE-62, Supplement 1	618
ACE-104	127
ACE-114	124
Egg Storage: A Selected Bibliography	703

BUREAU OF AGRICULTURAL ECONOMICS:

Agricultural Economics Bibliography:

No. 92	293
No. 93	285
No. 94	288
No. 95	288
No. 96	287
No. 97	436
F. M. 7	293
F. M. 10	292
F. M. 11	297
F. M. 12	297
F. M. 13	297
F. M. 14	285
F. M. 16	286
F. M. 18	297
F. M. 21	286
F. M. 23	292
F. M. 24	289
F. M. 26	286

BUREAU OF AGRICULTURAL ECONOMICS—Continued.

	Page
F. M. 27 and Supplement	60
Farm Rental Agreements in Caswell County, North Carolina	288
Farm Resources and Farming Systems Needed To Meet Living Needs of Farm Families in Five Type-of-Farming Areas.—I, Summary	435
Price Spreads Between the Farmer and the Consumer: Supplement to the Mimeographed Report of July 1936	294
Some Selected References Relating to the Impact of the War Upon the National Agricultural Program	285
Statistical Supplement to Volume and Characteristics of Migration to Arizona, 1930-39 (Arizona Agricultural Experiment Station General Bulletin No. 176)	877
Tariff Rates on Principal Agricultural Products (rev. 1941)	289
Type of Farm Tenancy Areas in Texas	287

AGRICULTURAL MARKETING SERVICE:

Retail Trade Practices and Preferences for Late-Crop Potatoes in Chicago and Suburbs, and Quality Analyses of Potatoes Offered for Sale to Consumers, 1939-40	299
---	-----

BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE:

Review of United States Patents Relating to Pest Control, vol. 14, Nos. 1-12, Jan.-Dec. 1941	87
Report of the Chief, 1941	5, 66, 87

FARM CREDIT ADMINISTRATION :	
Bulletin 42-----	440
Bulletin 44-----	296
Bulletin 45-----	439
Bulletin 46-----	439
Bulletin 47-----	295
Bulletin 48-----	441
Circular C-123-----	294
Circular C-124-----	295
Circular C-125-----	296
Miscellaneous Report 46----	440
News for Farmer Coopera-	
tives, vol. 8, No. 1, Apr.	
1941-----	869
Soils Manual for the	
Eleventh Farm Credit Dis-	
trict With Crop Require-	
ments Supplement-----	23
OFFICE OF FOREIGN AGRICULTURAL	
RELATIONS :	
Agriculture in the Americas,	
vol. 2, No. 1, Jan. 1942----	254
Foreign Agriculture, vol. 6—	
No. 2, Feb. 1942-----	284, 307
No. 3, Mar. 1942-----	284
No. 4, Apr. 1942-----	284
No. 5, May 1942-----	435
Foreign Agriculture Report	
1-----	735
Foreign Agriculture Report	
2-----	735
Foreign Agriculture Report	
3-----	736
FOREST SERVICE :	
Northeastern Forest Experi-	
ment Station Occasional	
Paper 13-----	226
Tropical Forest Experiment	
Station Occasional Paper	
1-----	803
Fire Control Notes, vol. 6,	
No. 2, Apr. 1942-----	227
Report of the Chief, 1941----	65
BUREAU OF PLANT INDUSTRY :	
[Soil Survey Report]—	
Series 1933—	
No. 37-----	632

BUREAU OF PLANT INDUSTRY—Con.	
[Soil Survey Report]—Con.	
Series 1936—	
	Page
No. 8-----	343
No. 10-----	343
No. 11-----	184
No. 12-----	632
Plant Disease Reporter—	
Vol. 25, Index, Dec. 31,	
1941-----	67
Vol. 26—	
No. 4, Mar. 1, 1942--	66
No. 5, Mar. 15, 1942--	66
No. 6, Apr. 1, 1942--	377
No. 7, Apr. 15, 1942--	377
No. 8, May 1, 1942--	527
No. 9, May 15, 1942--	527
No. 10, June 1, 1942--	680
No. 11, June 15, 1942--	680
No. 12-13, July 1-15,	
1942-----	680
No. 14, Aug. 1, 1942--	805
No. 15, Aug. 15, 1942--	805
Sup. 129, Dec. 31, 1940--	805
Sup. 133, June 15, 1942--	681
Sup. 134, Mar. 1, 1942--	70
Sup. 135, June 15, 1942--	680
Sup. 136, June 15, 1942--	680
RURAL ELECTRIFICATION ADMINIS-	
TRATION :	
Report of the Administrator,	
1941-----	278
SOIL CONSERVATION SERVICE :	
SCS Library List 2-----	300
SCS-PC-1-12-----	768
Physical Land Survey—	
No. 23-----	184
No. 24-----	184
Conservation Folders 1-14--	639
Erosion Survey No. 22-----	25
Hydraulic Studies of Conser-	
vation Structure at the Out-	
door Hydraulic Labora-	
tory, Spartanburg, South	
Carolina-----	
	429
Precipitation in the Muskin-	
gum River Basin [Jan.-	
Dec. 1941]-----	
	340

JOURNAL OF AGRICULTURAL RESEARCH

Vol. 64—

	Page
No. 4, Feb. 15, 1942---	49, 54, 57, 64
No. 5, Mar. 1, 1942--	204, 205, 252, 259
No. 6, Mar. 15, 1942---	219, 253, 260
No. 7, Apr. 1, 1942-----	167, 190, 216
No. 8, Apr. 15, 1942-----	359, 379, 383
No. 9, May 1, 1942--	473, 550, 556, 606
No. 10, May 15, 1942---	505, 538, 540

Vol. 64—Continued.

	Page
No. 11, June 1, 1942-----	646, 681, 688
No. 12, June 15, 1942--	646, 652, 683

Vol. 65—

No. 1, July 1, 1942-----	689, 705, 716
No. 2, July 15, 1942-----	802, 817, 846

EXPERIMENT STATION RECORD

VOL. 87

JULY 1942

No. 1

SOME SIGNIFICANT FINDINGS OF THE EXPERIMENT STATIONS IN 1941 (Part 1)

The preparation of the annual report to Congress by the Office of Experiment Stations on the work and expenditures of the agricultural experiment stations for the fiscal year ended June 30, 1941, has brought together the usual progress reports of the more than 3,000 Federal grant projects active at the stations during that year. It is now expected that in due course these activities will be discussed in that report, but on an abbreviated basis in conformity with the national need and policy to conserve both paper and the printing funds. In the meantime the opportunity is being availed of to place on record brief statements of a few of the more significant accomplishments. These examples have been selected as representative of the subject-matter fields covered in station research and the varied agricultural conditions and problems of the States and Territories. They are based on statements as to the work done and the progress made under each active Federal project, prepared by project leaders and made available to the Office by the station directors. It needs scarcely be emphasized that they are to be regarded as typical of the work but in no sense inclusive. The order of presentation is also largely random.

A simple low-cost plastic material from cottonseed-hull bran for the manufacture of sheaves for textile looms has been perfected by the Tennessee Station and developed in a commercial molding plant. Several hundred thousand of these sheaves already are in practical use and are demonstrating their superiority to those made of other plastics. Utilization of cottonseed-hull plastics for special purposes where strength and hardness are required promises to increase appreciably the value of a cheap byproduct of the cotton-production industry.

A coumarin compound has been isolated by the Wisconsin Station from sweetclover and identified as an anti-blood-clotting factor. Selective breeding of sweetclovers of low coumarin content is now possible to obviate the disease of cattle which sometimes develops

from sweetclover feeding and may cause bleeding to death from wounds. The discovery has also been found of value in human medicine, as the new compound and others related to it may be used in treating human diseases in which it is desirable to lengthen the clotting time of the blood.

Studies by the Kansas Station on the milling and baking quality of wheat indicate that undue importance has been given to test weight in grading wheat that has been swelled by exposure to rain. When the test weight of Turkey wheat of good quality was reduced as much as 6 pounds per bushel by wetting, a degree which would have meant heavy discounts if sold commercially, milling value was affected to only a negligible extent and in most cases the baking qualities were not impaired materially.

Improvements by the New Mexico Station in pinto beans as to color, maturity, and rust resistance have resulted in three new strains which have shown an increased value at average prices in New Mexico of about \$2 per acre on dry land and of \$11 on irrigated land. Sufficient seed was expected to be available in 1942 for the entire State.

Following studies by the Maine Station, a yield equivalent to at least 5,000 pounds of 4-percent milk per acre is being produced in that State with Ladino clover. This is from 1,000 to 1,500 pounds more than is usually obtained with common grassland crops on fertile soil.

Pasteurization of dill pickles shortly after the completion of the curing period was found by the North Carolina Station, in cooperation with the Department, to preserve crispness of flavor long after unpasteurized pickles have become unsalable because of softening. This development is seen as a boon to dill-pickle packers, especially in the Southern States.

Failures to control red scale insects, one of the most important pests of citrus, by fumigation with hydrocyanic acid have been found by the California Station to be due to the ability of certain resistant races of these insects to close their spiracles (breathing pores) when exposed to the gas and to keep them closed for at least 30 minutes. A search is being made for substances which can be combined with hydrocyanic acid and will result in earlier opening of the spiracles.

Double-hill planting of tomatoes was found by the Utah Station, in cooperation with the Department, to reduce greatly the loss of plants by beet leafhopper attacks and transmission of curly-top disease. Even under light infestation the increased yield paid for the extra plants needed. Cheesecloth covers were also effective but ordinarily too expensive.

A mixture of chloronaphthalene oil and crystal naphthalene 3 : 1, developed by the Massachusetts Station, gave complete control of red

spider of carnations in greenhouses and was less expensive than naphthalene alone.

In a search for cheaper sources of nitrogen in animal feeding, experiments with urea, a nonprotein compound in which the nitrogen generally costs only from one-fourth to one-third as much as its equivalent in the usual protein supplements, have been carried on in several States and Hawaii. The Wisconsin Station obtained very favorable results with urea as compared with linseed meal for dairy cows as to milk production, butterfat, protein, and vitamin C content of the milk, and the production of normal calves. In lamb feeding a lower value for urea than for linseed meal has been obtained by the New York (Cornell) Station when used as a practically exclusive source of nitrogen, but with equal parts of the two feeds the combination was only slightly less valuable than linseed meal alone.

Wide variations in fertilizer requirements of sugarcane under different environmental conditions have made economical use of fertilizers difficult of determination. The Hawaii Station, in cooperation with the Hawaiian Sugar Planters Association, has found that by sampling the sheath of the young mature leaf and determining the content of sugar, water, and minerals, a very reliable guide for fertilizing and irrigating can be obtained, based on known responses on soil types under local conditions of light and temperature. Such intensive application of fundamental scientific knowledge promises to decrease costs of production by securing sugar accumulation close to the highest level possible. This is an important contribution to the economic stability of a Territory largely dependent on its efficiency in production on a little over a quarter of a million acres.

The Missouri Station has succeeded in chemically combining the proteins of skim milk with iodine to produce an artificial thyroprotein which has the physiological properties of thyroid substance. In short feeding trials, milk production of goats was increased by feeding 5 to 10 gm. daily of the artificial thyroprotein, and cows which were falling off in milk production were stimulated to produce more milk by feeding 50 to 100 gm. daily. This cheap source of thyroprotein may prove a practical way of increasing milk production of dairy cattle.

A second and concluding installment of these notes will appear in the August issue.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical investigations by the Cornell Station] ([*New York*] *Cornell Sta. Rpt.* 1941, p. 123).—These include studies of butter oil, by V. N. Krukovsky, P. F. Sharp, and E. S. Guthrie, and errors in fat determinations due to lipolysis, by B. L. Herrington and M. Starr.

The coloring matters of plants.—I, Chlorophyll. II, Carotenoids. III, Anthocyanins, flavones, and related compounds, G. MACKINNEY. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 20 (1941), Nos. 10, pp. 313–314, fig. 1; 11, pp. 344–345, 356, figs. 3; 12, pp. 378–379).—The author presents in these three papers a brief semipopular outline of the chemistry of chlorophyll, of certain of the carotenoids, and of the anthocyanins, with some reference to changes in these substances during food processing.

The Bodroux-Tschitschibabin and the Bouveault aldehyde syntheses, L. I. SMITH and M. BAYLISS. (Univ. Minn.). (*Jour. Organic Chem.*, 6 (1941), No. 3, pp. 437–442).—The synthesis of aldehydes from Grignard reagents using ethyl-orthoformate was found superior to that using methylformanilide. The optimum conditions for conversion of bromobenzene to benzaldehyde via the Grignard reagent were determined.

The synthesis of *d,l*-citrulline from non-biological precursors, S. W. FOX, M. S. DUNN, and M. P. STODDARD. (Univ. Calif. et al.). (*Jour. Organic Chem.*, 6 (1941), No. 3, pp. 410–416).—The authors point out the need, in work on the nutritional requirements of bacteria and on other metabolism studies, for excluding the possibility of the presence of minute quantities of naturally occurring substances which may seriously affect the results. Amino acids synthesized from starting materials not of biological origin are therefore required. *d,l*-Citrulline was prepared from the nonbiological starting material cyclopentanone by the successive steps cyclopentanone oxime, α -piperidone, δ -amino-*n*-valeric acid, δ -benzoylamino-*n*-valeric acid, *d,l*- α -bromo- δ -benzoylamino-*n*-valeric acid, *d,l*- α -amino- δ -benzoylamino-*n*-valeric acid (*d,l*- δ -benzoylornithine), and *d,l*- α , δ -diamino-*n*-valeric acid monohydrochloride (*d,l*-ornithine monohydrochloride), which was converted by the action of copper oxide and urea into the copper salt of the required amino acid, *d,l*- α -amino- δ -carbamido-*n*-valeric acid. The free amino acid was obtained by treating the copper salt with hydrogen sulfide. Steps believed to be of special interest are the use of hydroxylamine sulfate in place of its generating substances, sodium nitrite and sodium bisulfite, and the preparation of δ -benzoylamino-*n*-valeric acid from cyclopentanone oxime in about 71-percent over-all yield.

Improved Bates laboratory aspirator, E. N. BATES (*U. S. Dept. Agr. Cir.* 630 (1942), pp. 12 figs. 8).—The aspirator described is a revision of an earlier design (E. S. R., 58, p. 738).

Improvement in determination of total nitrogen, A. E. MURNEEK and P. H. HEINZE (*Missouri Sta. Bul.* 438 (1941), p. 67).—A satisfactory Kjeldahl catalyst consisted of 0.1 gm. of selenium with 0.25 gm. copper sulfate and 0.7 gm. of mercuric oxide.

The colorimetric determination of cystine in tobacco mosaic virus protein, W. C. HESS, M. X. SULLIVAN, and E. D. PALMES (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 1, pp. 353-355).—It is concluded that this method can be applied satisfactorily to hydrolyzates of tobacco mosaic virus if humin formation is inhibited by hydrolyzing with HCl-TiCl_3 , or better with HI .

The determination of uronic groups in soils and plant materials W. V. BARTHOLOMEW and A. G. NORMAN. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 15 (1941), No. 3, pp. 253-260, figs. 3).—Automatic control of the reaction temperature and aeration rate is provided so that after the operation is started the apparatus requires no attention.

The determination of uronic groups in cellulose preparations is subject to error caused by carbon dioxide evolution from hexosan groups. The yield from this source, however, is probably lower than that from glucose. Evidence of the presence of true uronic groups in cellulose preparations or similar materials may be obtained by ascertaining the rate of liberation of carbon dioxide. A characteristic distribution curve with a sharp peak within the first 30 min. is given by compounds containing uronic acid groups.

Colorimetric determination of formaldehyde in the presence of other aldehydes, W. J. BLAEDEL and F. E. BLACET. (Univ. Calif.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 7, pp. 449-450).—The magenta color given by Schiff's reagent with formaldehyde in the presence of sulfuric acid does not fade appreciably during 6 hr., whereas the color given by the higher straight-chain aldehydes, glyoxals, and their polymers fades completely within 2 hr. Trioxymethylene reacts as does formaldehyde. The method can be made semiquantitative in character with the aid of a colorimeter.

A method for determining the lime requirement of Georgia soils, L. C. OLSON (*Georgia Sta. Cir.* 133 (1942), pp. 8, fig. 1).—A test and testing outfit intended to obviate the necessity for sending soil samples to the experiment station are here described. The test depends upon adding a barium sulfate-potassium chloride mixture and distilled water to the soil in a tube or shell vial, and testing the reaction of the supernatant liquid with bromothymol blue (or phenol red) indicator solution.

[Chemical investigations on insecticides] (*U. S. Dept. Agr., Bur. Ent. and Plant Quar. Rpt.*, 1941, pp. 102-104).—These included findings on normecotine, found to constitute 95 percent of the total alkaloids of a Maryland tobacco; sesame oil; and new methods of applying fumigants.

Photoelectric photometer for vitamin A estimation, A. F. PARKER and B. L. OSER (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 4, pp. 260-262, figs. 2).—The instrument described utilizes the sodium Lab-arc with suitable controls, the light from this source passing through the absorption cell, and a red-purple Corex A filter No. 986, to the sodium photocell, sensitive to ultraviolet radiation. This photocell is supplied with 90 v. and connected to the grid of an electrometer tube. The grid leak is brought through a slide wire to an appropriate potential relative to the filament of the electrometer tube. Any variation in the grid potential produces a variation in the current flowing through the electrometer tube which correspondingly produces a deflection of the galvanometer. The principles involved are the maintenance of static conditions in the electrometer tube by holding the grid potential at a constant value. This is accomplished by the use of the slide-wire potentiometer. The accuracy of the readings depends on the calibration of the slide wire, and this can be made with a precision of 0.25 percent.

A wide range of vitamin A concentrations can be covered by use of an absorption cell of either 1- or 10-mm. depth, it being possible to cover a range of 150 to 1

in a single dilution with a precision of 2 percent or better. The instrument is portable, simple and inexpensive of construction, and easily operated. "By the use of other light sources and filters, the instrument can be employed for making transmission measurements in other ranges of the ultraviolet; hence its scope is greater than for vitamin A assay alone."

Photoelectric vitamin A photometer, B. DEMAREST (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 6, pp. 374-376, fig. 1).—The new photoelectric instrument developed for the measurement of vitamin A uses a zinc-vapor lamp as a light source and a single sodium photocell. The advantages of the group of six zinc lines, effectively isolated by a single Corning No. 597 filter, over the sodium and argon lamps as light sources are discussed; the details of construction of the instrument are described and diagramed; the operation is outlined; and the precision is discussed. Although the results obtained in the use of the single photocell are affected by variations in the intensity of the light source, the error thus introduced is made negligibly small by restriction of the operating density range. The operating range 0.2 to 1.5, which gives an over-all theoretical precision of +1 percent, was selected. In determinations on 25 miscellaneous samples of fish-liver oils and concentrates, ranging in potency from 1,130 to 326,000 units of vitamin A per gram, the maximum difference between the present photometer (using the conversion factor 2,080) and the Bausch and Lomb spectrophotometer (conversion factor 2,000) was 3 percent. "This is consistent with the accuracy of +1.4 percent for the new instrument and ± 1.5 percent for the spectrophotometer, which is the precision assigned to this instrument as the result of a large number of determinations."

Physical and chemical determination of vitamin A, J. B. WILKIE (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 4, pp. 209-211).—This review, indicating the present status of the physical and chemical determinations of vitamin A, deals with (1) SnCl_2 reaction, its susceptibility to various factors affecting the developed spectral bands, reported modifications, and adaptation for use with the Evelyn photoelectric colorimeter; (2) ultraviolet absorption and adherence to Beer's law, factors for converting the $E_{1\%}^{1\text{cm}}$ value into biological units, and lability of the vitamin A molecule as a cause for discrepancies in either the ultraviolet absorption or the colorimetric methods; and (3) the stability of vitamin A as influenced by oxidation and by light. Literature citations number 49.

Vitamin A assays of plant tissues: Potential sources of error in sampling, L. E. BOOHER, E. M. HEWSTON, and R. L. MARSH. (U. S. D. A.). (*Food Res.*, 6 (1941), No. 5, pp. 493-498).—Biological assay values were determined by the U. S. P. XI procedure for 10 different vegetables before and after cooking. The raw vegetables were finely chopped and well mixed prior to sampling. The cooked vegetables were similarly sampled subsequent to cooking. For 3 of the raw vegetables—kale and commercially frozen spinach and peas—vitamin A values were determined by chromatographic separation of the carotenoid pigments followed by spectrophotometric estimation of the carotene and computation of vitamin A values on the basis of 0.6 $\mu\text{g.}$ of β -carotene being equal to 1 International Unit of vitamin A. For most of the green pigmented vegetables, including green snap beans, collards, kale, turnip greens, and frozen spinach, the values for the raw vegetables were notably lower than for the cooked vegetables sampled from the same lot of material. The vitamin A values, determined by chemical analysis of the raw vegetables, agreed with the bio-assay values for the cooked products. In preparation for chemical analysis these vegetables were finely cut and dropped immediately into absolute ethanol where they remained for 24 hr.

In tests with kale it was found that a sample finely macerated before weighing out the test supplements retained a negligible amount of the original vitamin A activity as determined by bio-assay. On the other hand, bio-assay of a sample of kale finely cut and dropped immediately into an ethanol-acetone mixture where it was held for 24 hr. before removal, and evaporation (under nitrogen) of the solvent, was comparable to the cooked kale in vitamin A activity. These results are interpreted to indicate that many raw plant tissues may contain enzymes capable of catalyzing the oxidation of carotene. Unless these enzymes are inactivated by preliminary cooking or by treatment of the uncooked plant tissue with a mixture of acetone and absolute alcohol, the biological assay values may be vitiated. It is suggested that root vegetables do not contain appreciable quantities of this enzyme, since vitamin A values of carrots and sweetpotatoes were not affected by cooking. The blanching of the green peas before freezing had apparently sufficed to inactivate any of the enzyme present in the fresh vegetable.

Recent developments in methods for determining carotene, W. J. PETERSON. (Kans. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 4, pp. 212-216, figs. 3).—Revised procedures presented for the extraction of carotene from dry and fresh plant tissues involve digestion of the sample with 10 percent ethanolic potash, filtration on a sintered-glass filter funnel, and washing of the residue and the extract with Skellysolve B. For the fresh plant tissue the digestion is repeated on the filter residue finely ground with quartz sand. Chlorophyllins, flavones, alkali, and xanthophylls are removed from the Skellysolve by extraction with 90 percent methanol, and the remaining solution, after washing with water and drying with anhydrous sodium sulfate, is made up to volume for determination of carotene concentration by the spectrophotometer, photoelectric colorimeter, or colorimeter by comparison with 0.1 percent or 0.036 percent potassium dichromate. The merits of the several methods are discussed, especially in the light of new developments of solvent and adsorption methods for the separation of β -carotene from accompanying petroleum-soluble carotenoids. It is pointed out that the Petering-Wolman-Hibbard method (E. S. R., 83, p. 438) has excellent potentialities in the development of methods for the quantitative determination of cryptoxanthin and other carotenoid pigments, as well as carotene.

Report on carotene, A. R. KEMMERER. (Tex. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem.*, 24 (1941), No. 4, pp. 859-865).—Two samples of alfalfa meal, one low and the other high in carotene, were subjected to collaborative study in the determination of carotene extracted by the tentative A. O. A. C. procedure and determined as crude carotene, and also as pure carotene following removal of colored impurities from the extract by adsorption on activated magnesium carbonate. Carotene in solution was determined by three methods—spectrophotometric, photoelectric colorimetric, and visual colorimetric against 0.1 percent $K_2Cr_2O_7$. From the results it appeared that there was slightly less variation among the various collaborators when the photoelectric colorimeter was used than with the visual colorimeter, and that the visual gave slightly higher results than the photoelectric colorimeter. Some collaborators found the photoelectric colorimeter quite stable and in need of only occasional checking, while the experience of others indicated the need for a daily checking against a standard of 0.02 percent potassium dichromate. Only three collaborators used the spectrophotometer, but it was the experience of the associate referee that the concentration of carotene in solution affects the extinction coefficients and that these coefficients as used in the A. O. A. C. procedure only hold for limited concentrations.

The tests indicated that the tentative A. O. A. C. method determines the quantity of crude carotene in the sample, and that other active pigments, such as cryptoxanthin in the case of corn, are also extracted and included in the final results. It is recommended, therefore, "that the heading 'carotene—tentative,' page 369, Methods of Analysis, A. O. A. C., 1940, be changed to read 'crude carotene in hays and dried plants—tentative.'"

Determination of carotene and cryptoxanthin in yellow corn, G. S. FRAPS and A. R. KEMMEIER. (Tex. A. and M. Col.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 11, pp. 806-809, fig. 1).—A complete chromatographic method for separation and identification of carotenoid pigments in yellow corn involved reflux digestion of the finely ground corn with 12 percent alcoholic KOH, extraction of the pigment from the digest with Skellysolve, dilution of the extract to volume, and determination of total pigment by photoelectric colorimeter, followed by concentration of the extract which was then poured upon a specially prepared column of magnesium oxide. Washing of the column with petroleum ether for 4 hr. caused separation of as many as seven bands, which were individually recovered from the column and washed with petroleum ether containing 2 percent of ethanol. Each eluate, after washing to remove the alcohol and drying with anhydrous sodium sulfate, was diluted to volume, and the amount of pigment, expressed as carotene, was determined photometrically. The pigments in the several bands were identified by the mixed chromatographic technic and by spectroscopic examination.

Results of chromatographic analyses of 22 samples of corn gave the following average values, as percentages for the total pigment: α -Carotene 3.5, β -carotene 28.7, K carotene (a new form of the pigment) 5.6, cryptoxanthin 34.4, neocryptoxanthin 17.3, and impurity 1.5. Biological tests showed the K carotene, cryptoxanthin, and neocryptoxanthin to have about half the vitamin A potency of β -carotene, while xanthophylls had no such potency.

An abridged chromatographic method, outlined in some detail, employed as an adsorbent the U. S. P. light magnesium carbonate with selection by test of a lot not too retentive of carotene. Under conditions of the test none of the three carotenes were adsorbed, while the cryptoxanthins and impurities were adsorbed. Approximate quantities of these constituents were calculated from the crude carotene.

Chemical methods for the determination of vitamin B₁, D. J. HENNESSY (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 4, pp. 216-218, fig. 1).—Recent chemical methods for accurate and rapid determination of vitamin B₁ are reviewed briefly. The Prehluda-McCollum reagent (E. S. R., 83, p. 10) as used by Melnick and Field (E. S. R., 83, p. 11) is considered suitable for determinations on materials of moderate and high potency, while the thiochrome method, having considerably greater sensitivity than the colorimetric methods, may also be used for the assay of materials of low potency. The use of the synthetic zeolite, Decalso, as a preliminary step in both procedures is recommended for effectively eliminating interfering materials. The thiochrome method as modified by Hennessy and Cerecedo (E. S. R., 82, p. 588) is suitable for routine analysis.

A modified thiochrome method for the estimation of vitamin B₁ in wheat and its products, H. JOHANSSON and C. E. RICH (*Cereal Chem.*, 18 (1941), No. 4, pp. 473-482, fig. 1).—With certain modifications the thiochrome method of Pyke (E. S. R., 85, p. 701), involving peptic and tryptic digestion of the sample, was found to be applicable to wheat and wheat products. Modification to insure complete extraction involved grinding the sample sufficiently fine to pass a 50-mesh sieve; extraction with a definite volume of acid rather than

such amount as would be required to make up to volume, since this latter amount would vary appreciably with the volume of the sample; and adjustment of the strength of the acid according to the buffer value of the material being analyzed to give a final pH between 2.0 and 2.5, the optimum for pepsin activity. Interfering materials in the extract were largely removed by making the solution up to 50 percent with alcohol and boiling, clarification and reduction of organic matter thus being effected. The addition of hydrogen peroxide served to destroy interfering color, due probably to flavone pigments, without oxidizing the thiamin. In the step involving oxidation to thiochrome it was found desirable to adjust the size of the aliquot used in the case of different products so that the amount of thiamin in the titrated extract would be between 0.4 and 3.0 μg . To avoid incomplete oxidation, the sodium hydroxide was added after mixing the ferricyanide reagent with the extract.

The method involving these modifications is given in detail, together with notes on the preparation of the standard thiochrome and on the use of the fluorimeter for visual measurement of the intensity of fluorescence. Protocols are presented to show the good agreement between replicate determinations, the efficiency of recovery (97-97.5 percent) of added thiamin, and the satisfactory agreement between the visual fluorimetric method employed and photoelectric methods in the analysis of bread, flour, bran, and germ.

The application of the thiochrome method to the thiamin analysis of cereals and cereal products, J. S. ANDREWS and R. NORDBØEN (*Cereal Chem.*, 18 (1941), No. 5, pp. 686-695, figs. 3).—The thiamin contents of a variety of cereals were determined by the rat growth method and by the thiochrome method of Hennessy and Cercedo (*E. S. R.*, 82, p. 588). The results of the two methods were in essential agreement. Operating details of the thiochrome procedure as applied to cereals are discussed from the standpoint of observations made in a series of investigations. Some of these observations are as follows:

Ideally the sample used should contain about 9 μg . of thiamin, this being sufficient to furnish 1 μg . in 5 cc. of purified extract taken for oxidation; a content between 5 and 15 μg . gives satisfactory results, however, without changing the amounts of solutions used in the zeolite purification. Either acetic acid or mineral acid may be used to stabilize the thiamin during extraction; with mineral acid, subsequent partial neutralization must be effected with a buffer salt, but with acetic acid a caustic produces the desired buffer action. Extraction equipment may be simple, merely a 250-cc. Erlenmeyer flask with a "cold finger" type of condenser, on a steam-heated water bath. Either taka-diastase or clarase may be used for the enzymatic hydrolysis, which serves to break down the starch, facilitating extraction and subsequent clarification, and to convert any cocarboxylase into free thiamin. In most cereals the quantities of cocarboxylase are negligibly small and the enzymatic hydrolysis may be omitted; it is necessary, however, in the case of wheat germ and bread. Evidence is presented to indicate that cocarboxylase in bread probably develops by conversion of the thiamin of the flour during fermentation. Filtration is considered more satisfactory and convenient than centrifugation for the clarification previous to base exchange on zeolite. Filter papers should be checked however, to see that they give rise to no appreciable losses by absorption. The tests showed that the zeolite treatment could be omitted without affecting the results; as a means of further simplification, the possibilities of direct extraction with 25 percent potassium chloride solution in 2 percent acetic acid were investigated. The results were promising and are being further studied.

Determination of thiamin by the thiochrome reaction, R. T. CONNER and G. J. STRAUB (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 6, pp. 380-

384, figs. 3).—The present study was concerned with defining more exactly than had been done previously the optimal conditions for carrying out the thiochrome procedure. A specially designed extraction tube, absorption tube, and separatory funnel were devised to facilitate the procedure, which was based on that of Hennessy and Cerecedo (*E. S. R.*, 82, p. 588). Optimal conditions involved the extraction and hydrolysis of the sample in the same vessel, thereby eliminating any error due to transfer of the extract; hydrolysis of the cocarboxylase with the enzyme *cl*rase; regulation of the amount of sodium hydroxide employed in the oxidation of thiamin to thiochrome so that 1 cc. of a solution of sodium hydroxide-potassium ferricyanide containing 0.45 and 0.002 gm. of these reagents, respectively, was used for solutions containing from 0.5 to 2.0 μ g. of thiamin chloride, optimal oxidation being thus obtained regardless of the pH of the thiamin solution or of the presence or absence of potassium chloride; and extraction of the thiochrome by a 1-min. mechanical shaking in the presence of 20 cc. of isobutyl alcohol.

For amounts of thiamin chloride ranging from 0.5 to 2.0 μ g., the conversion of thiamin to thiochrome was approximately 67 percent. Recoveries of thiamin added to various food samples amounted to 90 percent or better. The method applied to cereals and frozen vegetables was in close agreement with biological assays. Data are reported for a number of food products, including cereals, yeast, skim milk, cocoa, whey powder, and a few fresh and frozen vegetables.

Combined determination of riboflavin and thiamin in food products, R. T. CONNER and G. J. STRAUB (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 6, pp. 385–388, figs. 2). Study showed that riboflavin was rapidly destroyed by diffused laboratory light in aqueous solutions at pH values from 2 to 8, but that under artificial illumination destruction was slower and dependent upon the pH. The entire analysis was, therefore, carried out under controlled illumination, using Eastman safety lights equipped with series OA Wrattan light filters. From 3 to 5 gm. of the food sample were extracted with 0.04 N sulfuric acid, the extract was incubated with *cl*rase, and an aliquot was poured slowly through a small double adsorption column, the upper portion of which contained activated Dalcuso for adsorption of the thiamin and the lower portion Supersorb for adsorption of the riboflavin.

The thiamin, eluted with 25 percent KCl, was determined by the procedure noted above and the riboflavin, eluted with a solution of 20 percent pyridine in 2 percent acetic acid, was determined fluorometrically after destruction of interfering substances with permanganate. A Corning glass filter No. 511 was selected for transmitting the incident light and No. 351 for transmitting the fluorescent light.

Determination of vitamin B₂ (riboflavin): Comparison of bioassay, microbiological, and fluorometric methods, A. D. EMMETT, O. D. BIRD, R. A. BROWN, G. PEACOCK, and J. M. VANDENBELT (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 4, pp. 219–221).—Vitamin B₂ (riboflavin) determinations in extracts or concentrates of wheat germ, rice polish, rice bran, yeast, and liver were carried out by four methods, namely, (1) the rat-growth method of Bourquin and Sherman (*E. S. R.*, 66, p. 410), (2) the visual fluorescence procedure as described by Supplee et al. (*E. S. R.*, 83, p. 445), (3) the photoelectric fluorescence method as adapted by D. B. Hand,¹ and (4) the microbiological procedure of Snell and Strong (*E. S. R.*, 82, p. 587) by both the culture turbidity and acidimetry measurements. Results by the four methods were in good agreement, the greatest differences being with the low-potency

¹ *Indus. and Engin. Chem., Analyt. Ed.*, 11 (1939), No. 6, pp. 806–809, figs. 2.

samples. Further study of the microbiological method showed it to have excellent specificity and reproducibility, and to give similar results whether the final measurements were readings of culture turbidity after 24 hr. or acid production after 72 hr.

A modification of the Snell and Strong microbiological method for determining riboflavin. M. L. SCOTT, F. E. RANDALL, and F. H. HESSEL. (*Jour. Biol. Chem.*, 141 (1941), No. 1, pp. 325-326).—In determinations of riboflavin in foodstuffs excellent agreement was obtained between the Snell and Strong microbiological method (*E. S. R.*, 82, p. 587) and the fluorometric method of Hodson and Norris (*E. S. R.*, 83, p. 151), except in the case of wheat products in which recoveries of added thiamin sometimes amounted to 200 or 300 percent. Upon destruction of the starch in these products by autoclaving suitable samples in 250 cc. of 0.1 N HCl for 15 min. at 15 lb. pressure, followed by cooling and adjustment to pH of 4-4.5 and incubation with takadiastase at 50° [C.] overnight, with subsequent autoclaving for 5 min., the high values were no longer obtained upon application of the microbiological method. The results obtained with whole-wheat and red dog flours, patent flour supplemented with riboflavin and bread made from such flour, and with starch and added riboflavin suggested that lactic acid-stimulating properties were apparently due to the starch and could be destroyed by enzymatic hydrolysis with takadiastase.

On the colorimetric determination of vitamin B₆. J. V. SCUDI (*Jour. Biol. Chem.*, 139 (1941), No. 2, pp. 707-720, figs. 2).—The method described involves the reaction of the vitamin in neutral aqueous solution with 2,6-dichloroquinonechloroimide in the presence of veronal buffer (pH 7.6) and butanol. Butanol serves to stabilize the vitamin indophenol formed as the reaction product so that in the presence of veronal buffer the rate of decomposition is slow. At laboratory temperatures of 20°-24° [C.] the intensity of color (blue) reaches a maximum within 40 min. and remains constant between 40 and 60 min. The reaction mixture, shaken at 5- and 15-min. intervals after the addition of the reagent, is separated into two phases by centrifuging. Three volumes of the supernatant butanol layer, which contains the vitamin indophenol, is pipetted into 1 volume of absolute alcohol, and colors are read 50 min. after the addition of the reagent, using a visual comparator (10γ-40γ of the vitamin per cubic centimeter of test solution), a Bausch and Lomb spectrophotometer at 650 mμ (2γ-10γ per cubic centimeter), or an Evelyn photoelectric colorimeter with filter No. 660 (0.5γ-10.0γ per cubic centimeter). Consideration is given to the mechanism of the reaction, stability of dilute vitamin B₆ solutions, interfering substances and their removal, means of removing the vitamin from dilute solutions, and specificity of the test. A number of marks of specificity are given, including the use of a borate buffer, in the presence of which vitamin B₆ does not give the indophenol reaction.

Chemical estimation of nicotinic acid and vitamin B₃. H. A. WAISMAN and C. A. ELVEHJEM. (*Univ. Wis.*). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 4, pp. 221-225).—A general discussion of the chemical methods available for the determination of nicotinic acid indicates that they all depend upon break-down of the pyridine ring through reaction with such compounds as cyanogen bromide, 2,4-dinitrochlorobenzene, and phosphorus trichloride, with the liberation of nitrogen followed by conjugation of the carbon chain with some aromatic amine (aniline, *p*-aminoacetophenone, etc.). Reactions of this nature are considered fairly specific, since a great number of compounds containing the pyridine nucleus, including vitamin B₃ and many chemically important cell constituents, do not give the test; and since the few compounds

that have given a positive test occur in very small amounts, if at all, in biological materials and must be present in high amounts to give a fair color. Although the reaction is specific, certain cereals have been found to give high color development yet have no antipellagra activity. The chromogen responsible for the color test in these cases is liberated only by hydrolysis, so that the difficulty is obviated by water extraction of the cereal. The survey continues with consideration of (1) conditions of reaction, including solvents for the colored complex, absorption maxima (400, 420, 440 $m\mu$), time of reaction, H-ion concentration, influences of salts and effect of light and heat on color, and quantities of amine and cyanogen bromide; (2) difficulties, such as liberation of the vitamin from combined forms (by mild hydrolysis) and removal from interfering pigments (by preferential adsorption); (3) reagents used; (4) the procedure, essentially that of Melnick and Field (E. S. R., 86, p. 11); and (5) calculations of reading with the Evelyn photoelectric colorimeter.

Chemical estimation of vitamin B₆ is discussed with reference to chemical methods of possible value. Results obtained by the method of Swaminathan (E. S. R., 85, p. 441) are considered briefly.

A microbiological method for the determination of nicotinic acid, E. E. SNELL and L. D. WRIGHT (*Jour. Biol. Chem.*, 139 (1941), No. 2, pp. 675-686, fig. 1).—The requirement of the organism (*Lactobacillus arabinosus* 17-5 for nicotinic acid is used as the basis for the present assay method. A series of tubes in duplicate is set up as a standard to contain 0 γ , 0.05 γ , 0.1 γ , 0.2 γ , 0.3 γ , 0.5 γ , 0.7 γ , and 1.0 γ of nicotinic acid; another series of samples for assay is set up at increasing levels of concentration estimated to contain between 0.02 γ and 0.4 γ of nicotinic acid. After adjustment to 5-cc. volume, the addition of 5 cc. of basal medium, and sterilization, each tube is inoculated aseptically with 1 drop of a suspension of the organism prepared aseptically from a 24-hr. culture of assay inoculum. The tubes are incubated at 30° [C.] for a growth period of 72 hr. The response of the organism to nicotinic acid is then measured by titration of the lactic acid produced, using 0.1 N NaOH with bromothymol blue as indicator. The nicotinic acid of each "unknown" tube is read from the standard curve of response to nicotinic acid, such a curve being obtained with each set of assays. The average of values obtained at several levels on the curve within the assay limits is used. Details are given as to stock and inoculum cultures, preparation of the basal medium, and assay procedure.

Results of tests on various materials (animal tissues, cereal products, milk, and compounds related to nicotinic acid) are presented, including comparative values on certain of the samples analyzed by Elvehjem by the chemical and the dog methods. The preparation of the sample varies somewhat with the material, but water extraction, with or without autoclaving, of the finely ground sample suffices. The method is rapid, sensitive, specific for nicotinic acid (including its amide, cozymase, and nicotinuric acid), requires no preliminary treatment of tissue extracts to remove color or eliminate turbidity, and gives reproducible results and satisfactory recovery of added nicotinic acid. "By suitable modifications of the base medium, the procedure is also applicable to the determination of biotin and pantothenic acid."

Chemical determination of nicotinic acid, A. ARNOLD, C. B. SCHREFFER, and S. T. LIPSUS (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 1, pp. 62-63, fig. 1).—The method, here described in detail as to (1) preparation and treatment of the extract, (2) the instrument, and (3) readings and determination, is based upon the method of Harris and Raymond (E. S. R., 84, p. 274) involving the reaction of nicotinic acid and cyanogen bromide with *p*-aminoacetophenone as the color reagent. In order to insure adequate extraction of

the nicotinic acid, the present method introduces a preliminary step involving autoclaving (15 lb. per square inch for 15 min.) of the finely divided sample suspended in water. The extract (plus washings) is treated essentially according to the procedure of Harris and Raymond. In the present method, however, the color complex is extracted with ethyl acetate to permit the use of the fluorometer (Pfaltz and Bauer) in estimation of the concentration. Recovery experiments were very satisfactory, the method was found applicable to a wide variety of materials, and the results obtained were of the same order of magnitude as reported values obtained by bio-assay, or by other chemical methods. The following values, expressed as milligrams per 100 gm., were obtained: Fresh beef liver 9.2, fresh beef muscle 2.4 and 2.5, fat-free peanut meal, 22, defatted wheat germ 2.9 to 3.4, brewers' yeast 41, bakers' yeast 29 and 32, rice bran 28 and 29, and rice germ 15 and 16.

The chemical determination of nicotinic acid in milk and milk derivatives, C. I. NOLL and O. G. JENSEN (*Jour. Biol. Chem.*, 140 (1941), No. 3, pp. 755-762).—The method of Arnold et al., noted above, was found unsuitable for the determination of nicotinic acid in milk. Preliminary studies indicated that (1) alkaline hydrolysis caused the development of too much interfering color, (2) this difficulty was not eliminated by removing the proteins before hydrolysis, (3) hydrolysis with sulfuric acid (final concentration 8 percent) liberated the nicotinic acid and gave a hydrolyzate satisfactory for application of the test, and (4) *p*-aminoacetophenone should not be added to the blank. On the basis of these findings, the procedure developed for the assay of spray- or roller-dried skim milk powders involved hydrolysis of the sample (dissolved in water) with H_2SO_4 at a final concentration of approximately 8 percent, adjustment of the extract to pH 6.0-6.2, followed by dilution to volume, and determination of nicotinic acid in aliquots of the solution according to the method of Arnold et al. except that no *p*-aminoacetophenone was added to the blank and only one tube (containing 20 γ of added nicotinic acid) was used for standardizing the photometer. The modified method was successfully applied to rice polish derivatives and to milk and milk derivatives (from which added nicotinic acid was recovered quantitatively to within the probable experimental error of the analytical procedure). The dried skim milk samples analyzed by the method varied from 14 γ to 28 γ (average 18.3 γ) of nicotinic acid per gram, while the skim milk varied from 0.6 γ to 0.9 γ per cubic centimeter. These values are in general lower than other values cited from the literature.

The method of Melnick and Field (*E. S. R.*, 85, p. 584) appeared to be well adapted to the estimation of nicotinic acid in milk, but the choice of decolorizing carbon was important, since tests with a number of such carbons showed that they differed in specific decolorizing capacity.

The determination of nicotinic acid in bread and other cereal products, A. F. BINA, J. THOMAS, and E. B. BROWN (*Cereal Chem.*, 18 (1941), No. 5, pp. 661-666, fig. 1).—The method of Bandier and Hald (*E. S. R.*, 82, p. 586) was found inapplicable to flour and bread, since alkali treatment of the sample produced a semisolid mass from which nicotinic acid could not be completely extracted and since the subsequent acetone treatment produced turbidity and high blank values. The procedure developed for satisfactory preparation of the extract involved preliminary autoclaving of the finely ground air-dried sample at 15 lb. pressure for from 10 to 15 min., followed by digestion with takadiastase at 50°-60° C. for 1 hr. After centrifuging, the supernatant liquid (plus washings) was hydrolyzed by heating with hydrochloric acid for 30 min. on a boiling water bath. Upon cooling, this solution was brought to pH 4 with 20 percent NaOH, cleared by centrifuging, and brought to a final

pH of 6, the volume being carefully noted. Appropriate aliquots of this extract were used for color production essentially by the method of Arnold et al. noted on p. 12. The colorimetric reading was made with a Pfaltz and Bauer fluorophotometer used in combination with a blue and yellow filter to give a wave length of about 420μ . The relatively low extinction value of the blank was subtracted from that of the sample. The method, which is outlined in some detail as to reagents, apparatus, and procedure in the case of bread and flour, gave satisfactory recoveries of nicotinic acid.

A method for the estimation of nicotinic acid in milk, E. A. BAILEY, JR., W. J. DAN, G. H. SATTERFIELD, and C. D. GRINNELL. (N. C. Expt. Sta. et al.). (*Jour. Dairy Sci.*, 24 (1941), No. 12, pp. 1047-1053).—In the method developed the procedure of Perlzweig, Levy, and Sarett (E. S. R., 86, p. 712) is adapted for the preparation of a clear extract free from interfering substances. The essentials of the procedure are acid hydrolysis, 5 cc. of the skim milk being heated with 5 cc. of concentrated HCl on the water bath for 1 hr., and removal of interfering substances from the dark brown supernatant liquid by shaking a 15-cc. aliquot, adjusted to pH 1, with 2 gm. of Lloyd's reagent, which is separated by centrifugation, washed with dilute acid, and freed of nicotinic acid by elution with 10 cc. of *N* NaOH. Upon shaking the colored eluate with 0.6 gm. of finely powdered lead nitrate and removing the excess of lead from the supernatant liquid (through making slightly alkaline by the addition of small amounts of K_2PO_4 and adjusting the pH to 4.5 by the addition of a few drops of 20-percent orthophosphoric acid) a colorless extract is obtained. This extract is used for the color reaction by the method of Bandler and Hald (E. S. R., 82, p. 586), involving the reaction of nicotinic acid with cyanogen bromide and *p*-methylaminophenol sulfate (metol). The color developed is read in the Evelyn photoelectric colorimeter using the No. 400 filter and with the galvanometer set to read 100 with distilled water. The L value corresponding to the galvanometer reading obtained with this color development tube is corrected by subtracting the L value of the extract blank and the L value of the reagent blank (containing the metol as well as the KH_2PO_4 and CNBr).

Failure to decolorize the extract completely leads to high values. The necessity of using rather small samples (5 cc.) is stressed, since apparent values decrease as the size of the sample is increased. Determinations on 24 samples of milk, each run in quadruplicate, gave values such that the standard error of the means of four determinations was 7.2 percent of the average normal value, 1.46. Recoveries of added nicotinic acid ranged from 93.9 to 105.7 percent. The results of weekly analysis of the milk from six Ayrshire cows during January 1941 are given. The average nicotinic acid content of the milk from the normal cows is $1.46\ \mu\text{g. per cubic centimeter}$.

The quantitative estimation of nicotinic acid in animal tissues, W. J. DANN and P. HANDLER (*Jour. Biol. Chem.*, 140 (1941), No. 1, pp. 201-213, fig. 1).—The method developed stresses the necessity for complete extraction of the tissue and complete decolorization of the extract. The first requirement is met by grinding the tissue in water with fine sand before hydrolysis and by using acid hydrolysis. The second condition is met through adaptation of the method of Perlzweig, Levy, and Sarett (E. S. R., 86, p. 712) in which the nicotinic acid is adsorbed from the extract (adjusted to pH 0.5 to 1.0) with Lloyd's reagent, which is washed with dilute acid, then eluted with 0.5 *N* NaOH, the eluate being decolorized with lead nitrate. Removal of excess lead, and color development and estimation are accomplished by the method used by Bailey et al. (see above). In the calculation allowance is made for color development in the reagent blank. Precision and recovery appear to be highly satisfactory.

It is noted that small tissue samples (0.25–0.5 gm.), estimated to furnish from 30 to 40 μ g. of nicotinic acid, must be used to insure complete extraction and to accommodate to the volume relationships given. In adjustment of the extract to pH 4.5 after lead precipitation the volume of 20 percent H_3PO_4 must be minimal (1–2 drops) as the volume relationships are being disturbed. Evidence is given to indicate that the use of charcoal in decolorizing extracts is a source of error. Figures are given for the nicotinic acid content of a number of tissues of rats, chicks, and dogs.

Chemical methods for the determination of vitamin C, C. G. KING (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 4, pp. 225–227).—Of the various methods proposed, the reaction of ascorbic acid with 2,6-dichlorophenolindophenol provides the best general basis for analysis. The extracts must be carefully prepared to avoid oxidative changes previous to titration and circumstances under which other reducing substances will interfere with the titration. The first difficulty is generally avoided by the use of from 2 to 3 percent metaphosphoric acid as an extractant, in preference to sulfuric, acetic, or trichloroacetic acids, and the second difficulty may be compensated for by using an end point of 5 sec. or less in making direct visual titrations, or of making two or more readings at 15-sec. intervals when the photoelectric colorimeter is used. Such readings correct for interference due to more slowly reacting substances, such as thiosulfate, ferrous salts, certain sulphydryl compounds, and certain sugar decomposition products. Other methods of analysis, such as the method of Roe (*E. S. R.*, 77, p. 584) based upon furfural formation, may be preferable under special circumstances because of interference by reducing substances.

Methods for the measurement of dehydroascorbic acid are subject to great interference, since many aldehydes, a number of which are listed, ketones, and quinones give rise to an interfering reaction when reduced by hydrogen sulfide. The use of the furfural reaction, the use of a polarigraph, or decomposition of the dehydroascorbic acid at a pH above 7 and notation of the resultant change in value after hydrogen sulfide reduction are suggested as ways for detecting and avoiding such interference.

Rapid photometric determination of ascorbic acid in plant materials, S. A. MORELL. (*U. S. D. A.*). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 11, pp. 793–794, fig. 1).—The method described is an adaptation and modification of the Mindlin and Butler procedure (*E. S. R.*, 80, p. 728) as modified by Bessey (*E. S. R.*, 82, p. 14) to include colored or turbid solutions and plant tissue extracts. The new features reported here involve chiefly the methods of extraction, filtering instead of centrifuging, and various changes in concentration of reagents to permit measurement of a wider range (1–14 μ g.) of a ascorbic acid in the final aliquots. The fresh tissue was extracted with 3 percent metaphosphoric acid in a Waring blender, using two containers alternately to increase the output of the machine. The Evelyn photoelectric colorimeter was used with green filter No. 520, and the standard curve was calibrated, using pure ascorbic acid in concentrations increasing by increments of one from 1 to 14 μ g. per cubic centimeter. The modifications developed permitted great accuracy of determination as judged by recovery experiments, and also high-speed work on large numbers of plant samples daily.

A spectroscopic method for the quantitative estimation of vitamin D, N. A. MILAS, R. HEGGIE, and J. A. RAYNOLDS (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 4, pp. 227–231, figs. 7).—"Two independent physicochemical methods have been developed for the quantitative estimation of vitamin D in fish liver oils. One is based on the spectrophotometric estimation of $E_{1\%}^{1\text{cm}}$ values at 500 to 520 $m\mu$ of antimony trichloride color of various fish liver oils.

Corrections have been made for the presence of sterols and vitamin A, both of which seem to interfere with the vitamin D absorption band. The second method is based on a chemical treatment of the nonsaponifiable fraction of fish liver oils with maleic anhydride to destroy vitamin A, carotenoids, and possibly 7-dehydrocholesterol. The vitamin D in the treated nonsaponifiable portions is then estimated spectrophotometrically as in the first method. The results obtained seem to be in fair agreement with the biological."

A collaborative study of the A. O. A. C. chick method of assay for vitamin D. F. D. BAIRD and C. L. BARTHEN (*Jour. Assoc. Off. Agr. Chem.*, 24 (1941), No. 4, pp. 961-973).—In this study, conducted by the Animal Vitamin Research Council during the fall of 1940, five experiments were conducted and 31 laboratories in three regions (eastern, central, and Pacific coast) collaborated; 8,130 chicks were used in a total of 419 groups of at least 20 chicks each, except that only 10 chicks were used in negative control groups. The three sections into which the laboratories were divided did not show any apparent differences in results. The tests were so planned and conducted that the basal rations used by all collaborators were alike and the extraction and ashing technics were the same, but in spite of this standardization the accuracy of the method of test was not improved over that reported in other collaborative studies. Although environmental conditions within a laboratory may be an important factor, it is considered that an experimental animal that will react more uniformly is needed.

Assay results showed a wide variation in each laboratory as well as among all the laboratories. The assay oil used, a composite of 1 commercial fortified oils, each supposedly containing 400 A. O. A. C. chick units of vitamin D per gram, showed an estimated potency of from 360 to 375 units. The use of a depletion period, followed by the selection of chicks, did not make for greater uniformity and accuracy of results, but the use of a new basal ration (described) which had sufficient known nutritional essentials for the chick except for vitamin D did produce results slightly superior to those produced by the A. O. A. C. ration. Data obtained from a 4-week assay period were rather limited but seemed to indicate that there was nothing to be gained in accuracy by lengthening the assay period over the prescribed 3 weeks. The duplication of groups helped but little to achieve greater accuracy, but the averaging of duplicate groups did tend to smooth out the response curves.

Current developments in science likely to affect the food industries. M. A. JOSLYN (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 20 (1941), No. 9, pp. 277-283, 288, 294).—This is an address in which the topics chosen to illustrate the subject indicated are the chemistry of pectins, auto-oxidations, use of acids in fruit and vegetable products, and innovations in the chemical preservation of foods.

The desiccation of frozen foods in freezer locker stores. J. G. WOODMOOR. (Ga. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 20 (1941), No. 10, pp. 306-309, 321, figs. 11).—Fluctuation of temperatures due to overfrequent opening of the storage room, use of the storage room for freezing, and the use of cooling coils of inadequate size are found to be among the more conspicuous causes of drying out. The nature of the container or package, especially the degree of vapor proofing, is also emphasized. Effects of various types of packaging and of the use of sucrose, dextrose, and invert sugar sirup are among the observations recorded.

Wheat and flour technology. M. J. BLISH. (U. S. D. A.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 20 (1941), No. 9, pp. 284-286, 292).—This discussion is confined mainly to flour for commercial bread production and the technological control of the properties important in that use.

Some factors in the production of dried fruits, E. M. MEAK. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 20 (1941), No. 9, pp. 267-276, 293, figs. 16).—Natural and artificial drying are discussed, together with pretreatments, such as lye dipping, sulfuring, etc., and some of the contaminations and types of deterioration encountered in the pretreatment and sun-drying of several fruits. Diagrammatic drawings of various forms of evaporator and dehydrator plants are included. Artificial dehydration produces a dried fruit of better quality than is obtained by sun-drying, the yield is greater because of smaller losses from fermentation and respiration, it insures against rain damage losses, it reduces the drying time from several days to about 1 day, it is much more sanitary than sun-drying and protects against insect infestation, and the total costs need not be greater than those of a dry yard of equal capacity. On the other hand, it requires more skill than does sun-drying, and it is not possible to dehydrate such fruits as freestone peaches, apricots, nectarines, and pears to products similar in appearance to the sun-dried product unless they are first exposed to the sun for a day in order to fix the color of the fruit. Although flavor is not affected, this has definitely hindered the use of dehydration for cut fruits.

Results of a demonstration sale of apple-raspberry juice, C. S. PEDERSON, H. G. BEATTIE, and E. A. BEAVENS. (N. Y. State Expt. Sta. coop. U. S. D. A.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 20 (1941), No. 8, pp. 227-228, 247, fig. 1).—The blend as produced was the one selected as a result of numerous attempts to obtain a palatable product with a true flavor of both juices, and consisted of 75.8 percent apple juice (Baldwin and Cortland 2:1), 20.3 percent black and purple or red raspberry juice, and 3.9 percent added sugar. A variation of 1 percent one way or another in the proportion of raspberry juice, or the use of inferior fruit, affected the quality of the blend. From the favorable reception given the juice, which was far beyond expectation, it seems that the product has commercial possibilities.

Prune juice experiments, W. V. CRUESS, S. LEANORD, J. PONTING, and A. LANE. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 20 (1941), Nos. 7, pp. 196-198, 214, fig. 1; 8, pp. 233-234, 251, 253, fig. 1).—This paper deals with the results of experiments designed to improve the present methods of preparing the water extract ("juice") of dried prunes and of preserving it.

The freezing preservation of citrus fruits and juices, J. L. HEDD. (U. S. D. A.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 20 (1941), No. 12, pp. 375-377, 384, 389).—Methods are described. The importance of proper storing and handling is indicated, and attention is called to the fact that the success of commercial operations has depended upon the establishment of market outlets prior to the packing of products.

Fruit jellies.—XI, The rôle of pectin.—7, Demethylation of pectin and its effect upon jellying properties, G. L. BAKER and M. W. GOODWIN (*Delaware Sta. Bul.* 234 (1941), pp. [1]+48, figs. 18).—Continuing the work on pectins (E. S. R., 81, p. 471), the authors found that the rate of demethylation at 50° C., either during the extraction of pectin or the treatment of prepared pectins, is retarded at all acidities sufficiently to allow complete control of the reaction. Break-down of the pectin molecule is slow. The rate of demethylation, especially in the case of prepared pectins, was found to be proportionately retarded with increased concentrations of buffer substances or dehydrating agents. The rate also decreases with decreasing methoxyl content. It was found possible to make 65-percent sugar jellies with pectins containing as little as 3.5 percent methoxyl. No definite methoxyl content was indicative of optimum grade following all

methods of acid extraction and treatment, and partial demethylation generally improved grade. Improved grade was shown to be due largely to greater chemical-combining activity rather than to increased purity. Traces of calcium salt had little effect on the grade of demethylated pectins, but additional increments lowered the grade to a proportionally greater extent as the methoxyl content decreased. Jelly-unit recovery yields after partial demethylation of prepared pectins showed sharply increased commercial values. When sufficiently demethylated, pectins develop high viscosity values at pH 2. These appear to be indicative of degree of polymerization of polygalacturonic acid. An added polyvalent cation, such as calcium, causes the development of another high viscosity at pH 2.9. This secondary high moves toward pH 3.5 as the methoxyl content is reduced. Excess cation causes precipitation. If the methoxyl content is known, pectins may be graded approximately (on a 65-percent sugar solids basis) from their lowest viscosity values in the pH range from 2.5 to 2.9.

It was further observed that the optimum pH for gelatin of nonbuffered pectins decreases with decrease in methoxyl content; that partial demethylation of pectins reduces syneresis in jellies made from the product; that jellies melt at lower temperatures as the methoxyl content of the pectin or as the sugar content is reduced; and that aluminum chloride in concentrated solution, partially neutralized with ammonia to pH 3.55 without formation of the colloidal hydroxide, is an excellent precipitating agent for pectins of any methoxyl content at pH 4 to 4.5. Numerous other observations related either to the physical and chemical nature of pectins or to their commercial application are also recorded.

Dyeing maraschino cherries with erythrosine, C. A. WEAST. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 20 (1941), No. 11, pp. 332-333).—There has not been available hitherto a method of dyeing capable of giving a good color and at the same time of preventing diffusion of color from the cherries to the sirup or to other fruits. When the sulfur dioxide was washed out with water only, penetration of dye was slow and the color poor. Addition of calcium oxide, sodium carbonate, or sodium bicarbonate caused various degrees of softening or tissue break-down, loss of volume, and darkness of color. A satisfactory procedure was attained through washing out sulfur dioxide by heating with water until the test for bleaching of the indicator 2,6-dichlorophenolindophenol was negative, dyeing in hot 0.03-percent erythrosin in the presence of about 4 lb. of calcium carbonate to 100 gal. of the dye solution, washing in hot water, treating for 15 min. with 0.5-percent citric acid solution, and dipping briefly in cold water to remove excess acid before canning in sirup.

Abstracts of papers presented at the Technical School for Pickle and Kraut Packers, Michigan State College, East Lansing, Michigan, February 18, 19, and 20, 1941 (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 20 (1941), Nos. 7, pp. 209-212, 221; 8, pp. 238-242, 249, 252, 253).—The abstracts here noted follow a brief introductory statement by F. W. Fabian and H. L. Seaton: The Effects of Climatological Factors on Yield and Quality of Cucumbers, by H. L. Seaton and J. C. Kremer (pp. 209-210) (Mich. State Col.); Bacteriological Study of the Manufacture of Fresh Cucumber Pickles, by J. L. Etchells and H. B. Ohmer (pp. 210-211) (U. S. D. A. et al.); Pasteurization of Genuine Dill Pickles, by I. D. Jones, J. L. Etchells, M. K. Veldhuis, and O. Veerhoff (p. 211) (N. C. Expt. Sta. and U. S. D. A.); The Use and Interpretation of Quick Soil Tests, by C. H. Spurway (pp. 211-212), and The Preserving and Germicidal Action of Various Sugars and Organic Acids on Yeasts, by F. J. Erickson and F. W. Fabian (p. 212) (both Mich. State Col.); Notes on Salting Cucumbers, by M. K. Veldhuis, J. L. Etchells, I. D. Jones, and O. Veerhoff (p. 212) (U. S. D. A. and N. C. Sta.); Salting of Cucumbers—Influence

of Brine Salinity on Acid Formation, by I. D. Jones (p. 212) (N. C. Sta.); The Process of Changing Cabbage to Sauerkraut, by C. S. Pederson (pp. 212, 221) (N. Y. State Sta.); A Disease Control Program for Production of Quality Pickles, by J. H. Muncie (pp. 239-240) (Mich. State Col.); The Relation Between Quality and Chemical Composition of Canned Sauerkraut, by C. S. Pederson (p. 240) (N. Y. State Sta.); The Nutritive Value of Fresh Cucumbers and of Various Kinds of Pickles Made From Them, by L. J. Camillo, C. A. Hoppert, and F. W. Fabian (pp. 241-242), New Development in Cabbage Disease Control, by J. H. Muncie (p. 242), and Reliability of Organoleptic Tests, by J. C. Crist and H. L. Seaton (p. 242) (all Mich. State Col.); A Pressure Tester for the Determination of the Physical Quality of Salted Cucumbers, by I. D. Jones and O. Veerhoff (p. 242) (N. C. Sta.); Common Errors in Kraut Manufacture, by C. S. Pederson (p. 242) (N. Y. State Sta.); How Chemical and Physical Agents Kill Microorganisms, by F. W. Fabian (pp. 242, 249, 252) (Mich. State Col.); Bloaters in Sweet Stock, by J. L. Etchells and I. D. Jones (p. 252) (U. S. D. A. and N. C. Sta.); and Gaseous Products of Cucumber Pickle Fermentations, by M. K. Veldhuis and J. L. Etchells (pp. 252, 253) (U. S. D. A.).

A bacteriological study of the manufacture of fresh cucumber pickle, J. L. ETHELLES and H. B. OHMER. (U. S. D. A. coop. N. C. Expt. Sta. et al.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 20 (1941), No. 11, pp. 334-337, 357).—For the most part, only the resistant, spore-forming bacteria survived the pasteurizing procedure (160° F. for 20 min. or 165° for 15 min.), and these, in general, showed little or no increase during storage. Considerable populations of acid-forming bacteria and yeasts were built up during the overnight brining period of the slices. These organisms generally survive the application of hot liquor, and adequately controlled pasteurization is necessary to avoid spoilage.

Pasteurization of genuine dill pickles, I. D. JONES, J. L. ETHELLES, M. K. VELDHUIS, and O. VEERHOFF. (N. C. Expt. Sta. and U. S. D. A.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 20 (1941), No. 10, pp. 304-305, 316, 325).—Progressive softening spoilage was prevented by a pasteurization process consisting of packing the pickles in gallon cans in brine previously heated 15 min. at 170° F., sealing the cans, and then submerging them in water heated to such a point as to hold the internal can temperature for 15 min. at 140° or at 165° or to bring to 180°, followed by immediate cooling.

Observations on bloater formation in cucumber fermentation, I. D. JONES, J. L. ETHELLES, O. VEERHOFF, and M. K. VELDHUIS. (N. C. Expt. Sta. and U. S. D. A.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 20 (1941), No. 7, pp. 202-206, 219-220, figs. 6).—From these studies it is concluded that bloater formation is related to a gaseous fermentation. Factors which favor the development of a vigorous gaseous fermentation favor the production of appreciably large quantities of bloaters. Yeasts are believed to play an important part.

An occurrence of bloaters during the finishing of sweet pickles, J. L. ETHELLES and I. D. JONES. (N. C. Expt. Sta. and U. S. D. A.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 20 (1941), No. 12, pp. 370, 381, fig. 1).—The bloater formation is attributed to the fact that the pickles were finished at too low an acidity.

Notes on cucumber salting, M. K. VELDHUIS, J. L. ETHELLES, I. D. JONES, and O. VEERHOFF. (N. C. Expt. Sta. and U. S. D. A.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 20 (1941), No. 11, pp. 341-342).—Good salt stock can be produced in either sheltered or unsheltered vats. Growth of scum can be controlled on sheltered vats by frequent periodic agitation of the surface brine. Use of a suitable paint decreases brine leakage and imparts no flavor or other impairment of quality. Circulation equalizes brine concentration in

the vat. No other significant effect was observed. Vats emptied of salt stock can be kept sweet by draining off the brine, filling with water, and mixing in hydrated lime at the rate of about 10 lb. per 1,000 gal. of water.

Effect of cork on cider production from McIntosh, L. R. TUCKER. (Mass. State Col.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 20 (1941), No. 11, p. 343).—The author tested corky apples as cider stock, making comparable experiments with apples showing no cork or traces only and apples showing medium to heavy cork development. Fruit showing light cork development was excluded. The percentages of juice obtained from the corky and the non-corky apples, respectively, were 53.2 and 59.2; of soluble solids in the juice, 12.2 and 12; the pH value of the juice, 3.20 and 3.14; and the cubic centimeters of 0.1 N sodium hydroxide required to neutralize 10 cc. of the juice, 8.0 and 10.1. The sediment content of the juice from the corky fruit was relatively large but the flavor was good, though sweet enough to require addition of acid or of a more acid juice, and there was no off-flavor. Though not of as high a value per ton as noncorky fruit by reason of the higher sediment and lower yields and acidity of the cider, corky apples of the McIntosh variety can be used by the vinegar industry.

Refrigeration in wine making, G. L. MARSH. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 20 (1941), No. 8, pp. 235–237, 253, fig. 1).—The minimum cooling requirement for fermentation under ideal conditions is stated as 150,000 B. t. u. per 1,000 gal. on the basis of the observation that 1 lb. of sugar gives out at least 234 B. t. u. during fermentation, the exact value varying with the nature of the yeast and the juice. To allow for grapes of higher sugar concentration or with more field heat, a figure of 250,000 B. t. u. per 1,000 gal. should be used. A major factor in load calculation is the hours the winery operator wishes to devote to the cooling operation per day. The nature, placement, and behavior in operation of inside and outside refrigerating units is discussed. Wine storage temperatures are commonly around 50° F. and should never go below 40°.

Observations on the use of pectic enzymes in wine making, J. BESONE and W. V. CRUESS. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 20 (1941), No. 12, pp. 365–367, fig. 1).—Methods similar to the commercial procedures based on the work of the New York State Experiment Station on apple juice (E. S. R., 64, p. 713) and on grape juice (E. S. R., 65, p. 712) were applied to grape juices intended for wine making. Some samples of Muscat grape juice clotted and cleared by the action of enzymes naturally present. None of the juices examined showed any clearing after heating to 180° F., a temperature which destroys the enzyme action. Good clearing of all juices was obtained by heating to 175°, cooling, adding sulfur dioxide, and further adding either of two widely used commercial pectinase preparations.

The advantages of microbiological control in pulp and paper manufacture, J. R. SANBORN. (N. Y. State Expt. Sta.). ([*Tech. Assoc. Pulp and Paper Indus.*], *Tech. Assoc. Papers*, 23. ser., No. 1 (1940), pp. 615–616).—"The pulp, paper, and paperboard industry is acquiring a research background based upon physical, biochemical, and microbiological investigation which makes possible the production of more useful, sanitary, and efficient paper products for food packaging." The subject is here discussed from the standpoint of microbiological control.

AGRICULTURAL METEOROLOGY

Crop yields and weather, L. H. BEAN (*U. S. Dept. Agr., Misc. Pub. 471* (1942), pp. 111–131, figs. 22).—Material in this publication, prepared in cooperation with the U. S. Department of Commerce, "has been brought together to serve

the convenience of all those who have occasion to study or refer to monthly weather data in relation to crop yields per acre. . . . Crop yields per acre by States are available, of course, in various forms in current publications of the United States Department of Agriculture, and so are the monthly data of temperature and rainfall by States. But these two sets of basic material are not available in the compact form in which they are presented here. The Weather Bureau has supplied its compilations of monthly precipitation as percentages of normal by States from 1886 to 1939. These records, constituting the first set of data, are shown here in a series of monthly maps. . . . The second set of data, consisting of monthly departures from normal of both temperature and rainfall, had to be computed from the published records of the Weather Bureau. . . . The third set of data consists of the latest estimates of crop yields per acre taken from the records of the Division of Agricultural Statistics of the Agricultural Marketing Service."

Abundant illustrations throughout the records suggest that repetitions of weather fluctuations are not mere chance and that a more thorough knowledge of their characteristics would stimulate the search for the underlying causes. It is indicated that what seems to be needed is a thorough systematic examination of (1) the kinds of patterns that tend to be repeated, (2) the regularity of their appearance, (3) the tendency of patterns to appear in inverse or positive form, (4) the tendency for year-to-year repetitions to appear after a lag of 11-13 mo., or 9-11 yr., etc., and (5) the tendency for a positive or inverse parallel during the first half of 2 consecutive years to be followed by an inverse or positive one during the last half.

Climatological measurements for use in the prediction of maize yield, R. A. BAIR. (Iowa Expt. Sta. coop. U. S. D. A.). (*Ecology*, 23 (1942), No. 1, pp. 79-88, figs. 11).—Comparisons of the magnitudes of difference between weather records taken within experimental corn plats at Ames, Iowa, and determinations made a few hundred feet away at the official Weather Bureau station indicated that the alterations of wind movement, atmometer evaporation, and soil temperature and moisture by the plant covers render measurements of these factors made outside the field of little use in attempts to estimate growth and yield of corn. However, weekly means of relative humidity and of air temperature were so little modified by the corn plant cover that weather station records are probably applicable to factor conditions in corn fields for a radius of several miles. There are 18 references.

The use of climatic graphs in determining suitable areas for flax production, H. C. FORSTER (*Jour. Dept. Agr. Victoria*, 39 (1941), No. 10, pp. 515-524, figs. 7).—For determining the most suitable Australian areas, climatic studies were made for a number of centers. Graphs were prepared showing the progressive monthly values for available rainfall and temperature. Similar graphs were also prepared for those districts which had grown flax over the 3 preceding years, and on the basis of crop behavior at these centers tentative limits for length of growing season and temperature were obtained. The values thus worked out were used in indicating the most suitable of the new areas for this crop.

The relation of drainage to rainfall and other meteorological factors, P. N. SAHNI (*Jour. Agr. Sci. [England]*, 31 (1941), No. 1, pp. 110-115, fig. 1).—"Natural drainage periods, i. e., periods between consecutive cessations of flow of the Rothamsted 20-in. drain gage, were selected for the months of June, July, and August. All periods of from 2 to 13 days were taken. A curvilinear relationship between the difference of rainfall and drainage (deficit) and rainfall was established. Residuals from this curve showed no appreciable correlation with the mean air temperature, but there was some slight

evidence that the deficit was increased by a decrease in relative humidity or an increase in wind velocity. The residuals showed little correlation with drainage during the previous 3 weeks."

Snow surveys. (Utah Expt. Sta., U. S. D. A., et al.). (*Utah State Engin. Bien. Rpt.*, 22 (1939-40), pp. 63-64).—A brief summary of snow surveys in Utah for the biennium 1939-40, with comparisons for 1938.

The sun and the atmosphere, H. T. STRETSON (*Sigma Xi Quart.*, 30 (1942), No. 1, pp. 16-35, figs. 10).—The author reviews a few of the important ways in which the sun and the atmosphere are closely associated. The solar cycle, marked by the coming and going of sunspots, appears definitely to be reflected in geomagnetic phenomena of the earth, in the ionization of the upper atmosphere affecting all radio communications, in climatic cycles of the past, and in a somewhat complex manner with weather variations today. "Difficult as the pursuit of such investigations may be, results already attained are a stimulus to sustained effort."

Report of the five-day forecasting procedure, verification and research as conducted between July 1940 and August 1941, H. C. WILLETT ET AL. (*Mass. Inst. Technol. and Woods Hole Oceanog. Inst., Papers Phys. Oceanog. and Met.*, 9 (1941), No. 1, pp. 88, figs. 19).—This report is intended to cover fully the activities of the long-range forecast project both at the Massachusetts Institute of Technology and at the U. S. Weather Bureau in Washington, July 1, 1940, and August 1, 1941, and is in four sections: Organization of project, preparation of five-day forecasts, special investigations supplementary to the five-day forecasting procedure, and suggestions for additional research.

Long range forecasts of rainfall in India, S. BASU (*Sci. and Cult.*, 7 (1941), No. 5, p. 269).—A note on long-range forecasts which are said still to be issued in India as of September 18, 1941.

Monthly Weather Review, [November-December 1941] (*Mo. Weather Rev.* [U. S.], 69 (1941), Nos. 11, pp. 329-351, pls. 11; 12, pp. 353-383, pls. 14, figs. 4).—In addition to meteorological, climatological, solar radiation, and sunspot data, these numbers contain the following contributions:

No. 11.—The Thermodynamic Properties of Water and Water Vapor, by P. J. Klefer (pp. 329-331).

No. 12.—Rainfalls of 10 Inches, or More, During 24 Hours, in the United States, by S. S. Visher (pp. 353-356); The Record Rainfalls of the World (pp. 356-357); Preliminary Report on Tornadoes in the United States During 1941, by W. A. Matlice (pp. 358-359); The Weather of 1941 in the United States, by W. A. Matlice (pp. 360-362); North Atlantic Tropical Disturbances of 1941, by H. C. Sumner (p. 363); and Typhoons and Depressions Over the Far East, October 1941, by B. F. Doucette (pp. 363-364).

SOILS—FERTILIZERS

[Soil investigations of the Missouri Station] (*Missouri Sta. Bul.* 438 (1941), pp. 76-83).—Continuing earlier work (E. S. R., 83, p. 159), studies by H. H. Krusekopf, G. E. Smith, M. F. Miller, W. A. Albrecht, C. E. Marshall, E. M. Springer, and C. M. Woodruff are noted on the improvement of permanent pastures, increasing the productivity of Missouri pastures, nitrogen and carbon in soils under different systems of soil treatment and management, effects of different soil treatments on bacterial activity in the soil, crop rotation and fertilizer experiments, limestone as a source of calcium, land classification in Missouri, soil erosion, the properties of colloidal material in Missouri soils, and the nature of soils structure and its influence upon soil tillage.

[**Soil investigations by the Cornell Station**] ([*New York*] *Cornell Sta. Rpt.* 1941, pp. 92, 93-94, 95-96, 97, 98, 174).—Studies of the fundamental properties of the peat and muck deposits of New York, with special reference to zinc toxicity in the intensively cultivated areas, are reported upon by R. V. Staker; the relation of soil character to forest growth in the Adirondack region, by R. F. Chandler, Jr.; a study of oxidation-reduction phenomena in soils, with special attention to their influence upon the availability of those minor elements which are essential for the growth of crop plants, by R. W. Cummings and R. Bradfield; an investigation of the physical condition of important New York soils and of economical methods of maintaining them in better tilth, by Bradfield; a study of the potash requirements of crop plants grown on different soil types, by Bradfield and H. C. Thompson; and a study of soil reaction for vegetable crops, by P. H. Wessels and R. H. White-Stevens.

Soils manual for the Eleventh Farm Credit District, with crop requirements supplements, G. W. PATTESON, A. B. BEAUMONT, and R. L. ADAMS (*U. S. Dept. Agr., Farm Credit Admin., 1941, pp. [1]+595, pls. 10*).—This manual is designed to assist the appraiser in understanding the physical factors entering into land values—the soil, the climate, and the crop. A brief explanation of the principal factors entering into soil formation is therefore included, together with maps to show the distribution of soil-forming materials, climatic conditions, and natural vegetation in the Eleventh Farm Credit District, embracing California, Nevada, Utah, and Arizona; a general map showing the important soil regions of the United States, with explanatory notes on the general distribution of the great soil groups; a brief explanation of the general classification of soils, with special reference to the methods followed by the Division of Soil Survey of the Bureau of Plant Industry in mapping the soils of the United States; the soil areas of the eleventh district by sections and groups in a general outline map; a key to the individual soils by sections based on position (upland, terrace, etc.), drainage, color of surface soil, and color and nature of subsoil; and an alphabetical list of the soil series, with a brief statement of the important characteristics of each.

Chemical properties of some representative samples of certain great soil groups and their relation to genetic soil classification, L. T. KARDOS and C. C. BOWLSBY. (Wash. Expt. Sta.). (*Soil Sci., 52 (1941), No. 5, pp. 335-349, figs. 10*).—The authors record an investigation of the relation of the carbon : nitrogen ratio of the colloids and of their silica : sesquioxide ratio to the neutralization curve.

The percentage of organic carbon in the whole soil was smaller, in general, than that in the clay fraction, and the carbon : nitrogen ratio of the organic matter in the clay fraction of the Pedocal group much narrower than that of the Pedalfers group. The silica : sesquioxide ratios were found to bear a close relationship to the activity of the inorganic acidoid fraction in delineating the neutralization curve, but the total acidoid : basoid ratio of the colloidal complex is believed probably to be the most decisive factor in determining the neutralization curve. The entire curve considered as a unit was found to indicate the type and extent of the weathering process, whereas the equimolar pH, though uniformly lower in the Pedocals than in the Pedalfers, did not provide an inclusive measurement of the acidoid : basoid ratio. The base-binding capacity at pH 7 was found to be related to the total active acidoid fraction in the colloidal complex but did not bear a linear relationship to the different soil-weathering processes. The Lynden and Spanaway series from the Pacific coast, which have been designated as belonging to the Gray-Brown Podzolic group and the Prairie group, respectively, are shown to have assumed

lateritic attributes. The neutralization curves were found to measure prominent differences in the acidoid:basoid ratio adequately and to be a reliable basis for classifying soils into large groups, such as Pedocals and Pedalfers. With proper consideration of other soil attributes, they may also be used to delineate the climatic zonal soil groups.

A method of preparing soils for petrographic analysis, C. D. JEFFRIES. (Pa. Expt. Sta.). (*Soil Sci.*, 52 (1941), No. 6, pp. 451-454).—The author first removes organic matter by treatment with hydrogen peroxide. He then treats the soil suspension with oxalic acid in the presence of a cylinder of aluminum tubing, the nascent hydrogen and oxalic acid serving to remove iron oxides present as coatings or as a cementing agent. After removal of the aluminum cylinder the suspension is further treated with small quantities of hydrogen peroxide and hydrochloric acid to dissolve any ferrous oxalate precipitated in the soil. After flocculation (assisted by addition of ammonium chloride) the soil is washed free from dissolved iron compounds by means of a 5-percent solution of sodium chloride in 0.001 N oxalic acid. For mechanical analysis the cleaned and dried soil is dispersed in dilute sodium carbonate solution at pH 8.

Upon microscopic examination the sands and silt prepared by this method were found to be excellent for petrographic study. The particles were clean and discrete, and no difficulty was encountered in making heavy liquid separations. As far as could be determined by means of the microscope, no minerals had been attacked by the treatment.

Soil sampling tube with inner liner, A. B. BEAUMONT. (Mass. State Col.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 1, p. 84, fig. 1).—A hardened steel bit is so fitted into the main tube of brass that the steel is flush with the brass outside but provides about $\frac{1}{16}$ -in. clearance between the inside diameter of the short steel bit and the greater inside diameter of the brass tube. This clearance permits the insertion of a liner of waxed wrapping paper or of a suitable plastic sheeting. The top of the brass tube is protected by a steel driving collar, shrunk on.

Some physicochemical aspects of soil aggregates, H. E. MYERS. (Kans. Expt. Sta.). (*Soil Sci.*, 52 (1941), No. 6, pp. 469-480).—A study of the stability of soil aggregates in liquids of varying dielectric constants showed that the two variables were inversely related. Wetting air-dry soils for 20 min. with toluene, benzene, carbon tetrachloride, kerosene, and petroleum ether, and wet-sieving in water while the soils were still wet with the organic liquid resulted in a marked dispersion of the aggregates. The marked dispersing effect resulted only when the soil was wet with the liquid at the time contact was made with the water. Treatment of air-dry soils with ethyl and methyl alcohols before wet-sieving in water increased the percentage of water-stable aggregates larger than 0.105 mm., whereas previous treatment with diethyl ether decreased slightly the percentage of water-stable aggregates larger than 0.105 mm. as compared with pretreatment with water only. Swelling measurements showed that pretreatment with ethyl and methyl alcohols decreased the swelling of soils in water at the end of 24 hr. in comparison to those samples wet only with water. Pretreatment with either toluene or diethyl ether caused a marked increase in swelling in water.

Dispersion was found to be associated with the swelling of soils, although some exceptions to the general relationship indicated that swelling will not alone explain dispersion.

Studies of clay particles with the electron microscope.—I, Shapes of clay particles, R. P. HUMBERT and B. SHAW. (Ohio State Univ.). (*Soil Sci.*, 52 (1941), No. 6, pp. 481-487, pls. 2).—The authors briefly describe a technic for mounting soil colloidal particles on films of a thickness adequate to permit electron beam photomicrography. They present electron photomicrographs which sub-

stantiate the beliefs of Marshall (E. S. R., 85, p. 446) and others regarding the plate-shaped nature of clay particles. Preliminary investigations show the crystallinity of kaolinite to be much better developed than that of montmorillonite.

An important effect of soil colloids on plant growth, J. S. PAPADAKIS (*Soil Sci.*, 52 (1941), No. 4, pp. 283-290, figs. 2).—Culture solutions in which roots had been grown were found deleterious to other plants, and increasing the number of plants growing in a solution decreased the yield. These effects were experimentally shown not to be attributable to exhaustion of nutrients. Experiments with mixtures of fine gravel and fine soil showed that plant yields increase considerably when the proportion of fine materials increases, the increment being greater with high levels of nutrients or moisture than with low levels. The effect of increasing the proportion of fine soil, though slight at the beginning, became more and more pronounced as growth advanced. As an explanation of these observations the author holds that soil colloids absorb the living root toxins and aid in their oxidation, and that, in addition to their influence on the chemical and physical properties of the soil, soil colloids increase the available space. With the highest levels of nitrogen, phosphorus, and water, the yield increased in the corn experiment from 3.78 to 27.26 gm. per pot when the proportion of fine soil increased from 10 to 40 percent.

Colloidal organic acids as factors in the weathering of anorthite, E. R. GRAHAM. (Mo. Expt. Sta.). (*Soil Sci.*, 52 (1941), No. 4, pp. 291-295, fig. 1).—In 110 days, H humate, H agar, H bentonite, and acetic acid weathered anorthite effectively. The H bentonite, H humate, and H agar weathered more calcium than the monomolecularly dispersed acetic acid. Systems with comparatively small proportions of dissociated hydrogen weathered as much calcium from anorthite as others, when the total acidity was the same. These results indicate that the colloidal humus of soils, if unsaturated, may become an effective agent in transferring bases from the crystal of primary minerals to the colloidal portion of the soil.

Soils of Puerto Rico classified by geological formations, series, types, and phases, with productivity rating of each based on inherent qualities of the land, area, and per cent of total area, R. COLÓN TORRES (*Puerto Rico Univ. Sta. Mimeog. Rpt.* 19 (1941), pp. [3]+18).—A mimeographed report on the soils of Puerto Rico, giving tabular data on the area and productivity rating of each type or phase. The report is intended to provide some of the more important information to be given in the forthcoming Soil Survey of Puerto Rico.

The organic matter in Collington sandy loam and in the eroded material, J. P. MARTIN. (N. J. Expt. Stas.). (*Soil Sci.*, 52 (1941), No. 6, pp. 435-443).—The percentage of organic matter and nitrogen in the eroded material depended upon the intensity of the rainfall, upon plot treatment, and upon the individual plot. During approximately 2.5 yr. the percentage organic matter in the soil lost by erosion was from four to five times as great as that in the soil of the plots. From plots representing four annual treatments (fertilizer, fertilizer + rye cover crop, fertilizer + 20 tons of stable manure, and fertilizer + rye cover crop + 20 tons of stable manure), the respective averages of 1,185, 730, 950, and 415 lb. of organic matter per acre were lost during the 2.5-yr. period. Soil eroded from plots contained greater percentages of nitrogenous complexes and hemicelluloses than the original soil, suggesting selective erosion of certain fractions of the organic matter.

Erosion and related land use conditions on the Box Elder Creek project, Nebraska, H. C. MORTLOCK and R. D. GREENAWALT (*U. S. Dept. Agr., Soil Conserv. Serv., Erosion Survey*, 1941, No. 22, pp. [1]+34, figs. 10, maps 2).—From this survey of existing conditions, it is concluded that all slopes in excess of 6 percent should be farmed with use of cover crops between

periods of occupation by intertilled crops and with careful adjustment of tillage to the slope of the land. Contour tillage should replace uphill and downhill farming. On slopes greater than 10 percent, intertilled crops should not be grown in immediate succession, and on all areas where erosion is becoming increasingly evident, grassed waterways, terraces, diversion terraces, and the like are needed, as well as improved cropping practices. On all the steeper slopes, seeding to long-term meadows and to permanent pasture for stabilization should be undertaken. Severely gullied areas should be reforested to useful trees, and existing woodlands as well as new plantings should be protected against fire and grazing.

Wind erosion of soil in relation to roughness of surface, W. S. CHEPL and R. A. MILNE (*Soil Sci.*, 52 (1941), No. 6, pp. 417-433, pl. 1, figs. 6).—The rate of soil flow under a wind force was found to vary inversely with the roughness of the surface. The value of the constant k' required in determining the value of one of the terms in a formula for rate of soil flow was found, however, to be dependent not only on the height of the surface obstructions but also on their nature and lateral frequency.

Ridging cultivated soils markedly reduced the initial rate of soil flow under all wind velocities used. Factors tending to reduce the rate of soil flow over a ridged as compared with a smooth surface appeared to be the reduction in the average wind velocity for some distance above the average surface and the trapping of soil on the leeward side of ridges. Those tending to increase the rate of flow over ridges appeared to be greater eddying of wind and greater wind velocity and consequent increase of erosion at the crests of ridges. The gross effect of the former pair of factors was always markedly greater than that of the latter.

New landmarks of soil conservation (*U. S. Dept. Agr., Misc. Pub. 473* (1942), pp. [24], figs. 43).—This is a popular outline of the causes and effects of sheet and gully erosion and of the measures generally practiced for erosion and run-off control. The presentation is largely pictorial, the illustrations having brief explanatory text interspersed.

Delta soil fertility studies, R. KUYKENDALL (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 2, p. 4).—Results of from 3 to 7 years' fertilizer experiments on fields representing four soils are tabulated, and some general conclusions are indicated.

Chemical soil diagnosis by the universal soil testing system, M. F. MORGAN (*Connecticut [New Haven] Sta. Bul. 450* (1941), pp. 575-628, pls. 8, fig. 1).—This is a further revision of Bulletin 392 (*E. S. R.*, 77, p. 302).

Foliar diagnosis in relation to soil heterogeneity, W. THOMAS and W. B. MACK. (*Pa. Expt. Sta.*). (*Soil Sci.*, 52 (1941), No. 6, pp. 455-468).—The authors point out that the effect of a fertilizer on yields may be the result of its influence on the intensity of nutrition or on the physiological relations among the elements as expressed by the equilibrium among them or on both values simultaneously. With respect to these values, the results indicated that "the intensity of the higher-yielding duplicate is nearer the value of the optimum than its lower-yielding companion, and in most cases the value is higher. Although the values for the intensities of nutrition of individual plants do not follow the exact order of yields, the generalization may be made that low intensities are associated with low yields and high intensities with high yields. In other words, a sufficient intensity is necessary for high yields. Hence, an intensity above optimum values has a less injurious effect on yields than has one below optimum. With a sufficient intensity of nutrition the determining factor causing differences in yields between duplicates is the relative displacement in the $N-P_2O_5-K_2O$ equilibrium,

indicated by an approach to the value of the optimum by the higher-yielding duplicate. Much higher values for the intensity, however, which approach the values for the optimum may overbalance a recession of the equilibrium value from that of the optimum."

Moisture distribution in soil in containers, A. H. HENDRICKSON and F. J. VEIHMEYER. (Univ. Calif.). (*Plant Physiol.*, 16 (1941), No. 4, pp. 821-826, figs. 3).—In order to secure a uniform distribution of moisture for plants growing in a container it is necessary to add sufficient water to wet the entire soil mass to the moisture equivalent. When less than this amount is added, only the top layer is moistened to the moisture equivalent, while the soil at the bottom remains dry if no cracks are present. Plants growing in soil held under "medium" soil moisture are not under uniform conditions but have part of their roots in the moist top layer and part in the dry layer beneath. Movement by capillarity is so slow that the plant exhausts the available moisture in the top layer before any appreciable movement can take place.

Relation of field capacity to moisture equivalent in soils of West Virginia, G. M. BROWNING. (W. Va. Expt. Sta. coop. U. S. D. A.). (*Soil Sci.*, 52 (1941), No. 6, pp. 445-450, figs. 4).—In a fine sandy loam, four silt loams, and one clay soil, it was found that at the average of all sampling depths the ratio of field capacity to moisture equivalent is unity in the vicinity of a moisture equivalent of about 21 percent, more than unity for moisture equivalents below 21 percent, and less than unity for moisture equivalents above 21 percent. The ratio decreases slightly with depth, but the shape of the curves for different depths is, in general, the same.

The possibilities and limitations of field capacity or moisture equivalent, corrected for texture, as a means of determining capillary porosity are discussed in relation to the more precise methods for determining pore size distribution.

Soil atmosphere: Vital but little-known crop factor, O. A. LEONARD (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 2, p. 7).—Some of the effects upon plants of the composition and degree of freedom of movement of the soil air and some conditions influencing soil aeration are briefly reviewed.

Intake of certain elements by calciphilic and calciphobic plants grown on soils differing in pH, W. H. BENDER and W. S. EISENMENGER. (Mass. Expt. Sta.). (*Soil Sci.*, 52 (1941), No. 4, pp. 297-307, pl. 1).—Nine important agronomic crop plants and one vegetable (barley, wheat, oats, sweetclover, cowpeas, peanuts, Kentucky bluegrass, timothy, redtop, and tomato) were grown in crocks of Chango loam of pH 4.4 and 7.3±. These plants were analyzed for total ash, insoluble ash, calcium, magnesium, nitrogen, phosphorus, potassium, and iron.

The total ash and the intake of calcium, magnesium, nitrogen, and iron increased in the plant when calcium hydroxide was added to the acid soil. In general, the intake of phosphorus decreased with the addition of calcium. Potassium increased or decreased mainly in accordance with the species of plant grown. The plants grouped as intermediates were consistent in their intake of elements. The calciphobic plants were comparatively consistent, and the calciphiles showed great variability in their absorption of elements. On the basis of percentage composition, all the plants at higher pH contained more calcium than at lower pH; also under the same condition 80 percent of the plants contained more magnesium, 90 percent contained more nitrogen, and 80 percent contained more iron. On the other hand, 70 percent of the plants obtained more phosphorus from the acid soil than from the less acid soil.

The pH of irrigated orchard soils, A. R. C. HAAS and O. C. COMPTON. (Univ. Calif.). (*Soil Sci.*, 52 (1941), No. 4, pp. 309-333).—The pH values found in soil in situ at various depths in orchards indicated an acid condition. When field determinations of pH were rechecked the same day in the laboratory, on the original

samples stored in closed containers, it was found that storage usually, but not always, was accompanied by an increase in the pH values. Gradients in the pH values of orchard soils from the various depths may take either or both directions.

In fertilizer trials in certain lemon orchards, the ammonium phosphate-treated soil was more acid than either the manure- or the calcium nitrate-treated soils and produced the best results. The exclusive use of manure in certain orchards was accompanied by relatively high pH values in the soil and by symptoms of minor-element deficiency in the leaves, whereas the use of ammonium sulfate as a supplement was accompanied by a reduction in the pH and by no deficiency symptoms. The application of virgin soil to an old orchard resulted in marked benefits, now obtainable from certain sprays. Many old orchards were found to be in acid soils when the pH values were determined at the field moisture content. When growth was healthy, an acid condition could be found in some part of the soil. Many orchards were successful when the pH values of the soil at the 1:5 soil:water ratio were 8 or higher, provided the soil moisture was kept under control and limitations were made thereby on the extent of hydrolysis.

Influence of microorganisms on soil aggregation and erosion, II, J. P. MARTIN and S. A. WAKSMAN. (N. J. Expt. Stas.). (*Soil Sci.*, 52 (1941), No. 5, pp. 381-394).—The action of micro-organisms in Bermudian clay loam and Collington sandy loam was found, in a continuation of previous work (E. S. R., 84, p. 156), to result in a marked aggregation of the soil particles. The extent of aggregation depended upon the nature of the organic and inorganic materials added. Alfalfa and straw were more effective than manure, which, in turn, was more effective than peat or lignin in establishing aggregates. Complex organic materials, together with lime, maintained a better state of aggregation of the clay loam soil than did the organic substances alone. Lime alone exerted a small and gradually increasing effect upon the silt and clay particles of the moist soil. This effect was not so apparent after the soil was dried. The dried soil receiving lime showed an increase in the percentage of very small aggregates only. Lignin and casein together produced greater aggregation in the clay soil than did casein alone, as determined by tests on the moist soil. After the soil was dried, the effects of casein alone appeared to be greater than the effects of casein and lignin used in combination.

The interaction of higher plants and soil microorganisms.—III, Effect of by-products of plant growth on activity of fungi and actinomycetes, M. I. TIMONIN (*Soil Sci.*, 52 (1941), No. 5, pp. 395-413, pls. 3).—The work here dealt with continues an investigation previously noted (E. S. R., 85, p. 69). Numbers of *Alternaria* and *Cephalosporium* species of *Fusarium culmorum* and of *Helminthosporium sativum* were lowered in the rhizosphere of a resistant variety of flax. *Mucor*, *Cladosporium*, and *Penicillium* species and *Trichoderma viride* were stimulated by the resistant flax. A susceptible variety produced the reverse effect. The resistant variety yielded from 25 to 37 mg. of hydrocyanic acid per plant to the culture solution, the susceptible variety only a trace. Potassium cyanide, at the rate of 8.2 mg. per 100 cc. of culture solution, had an effect similar to that of the resistant flax variety.

Methods for growing plants under aseptic conditions and other technic are fully described.

The survival of microorganisms in alkali soils, J. E. GREAVES and L. W. JONES. (Utah Expt. Sta.). (*Soil Sci.*, 52 (1941), No. 5, pp. 359-364).—Alkali soils containing approximately 2 percent of soluble salts were kept for 20 yr. under air-dry conditions. All these soils then had an active ammonifying micro-

flora which compared favorably with that of fertile soils. *Nitrosomonas* and the *Nitrobacter* were apparently absent, neither nitrites nor nitrates being produced when the soils were inoculated into appropriate media. *Azotobacter chroococcum* was found in some of the soils even after 20 yr. These actively fixed nitrogen when seeded into an appropriate medium. It is concluded that ammonifying and nitrogen-fixing micro-organisms can survive for long periods in soil, the water content of which is saturated with sodium chloride, sodium sulfate, or sodium carbonate, either individually or in combination. The nitrite- and nitrate-producing bacteria, however, disappear from such soils.

Effect of borax and lime on activity of soil microorganisms in Norfolk fine sandy loam. W. J. HANNA and E. R. PURVIS. (Va. Truck Expt. Sta.). (*Soil Sci.*, 52 (1941), No. 4, pp. 275-281, pl. 1).—Measurements of amounts of carbon dioxide evolved show that borax increased microbiological activity at both pH 5.1 and 7.7, more at the higher reaction. Plate counts show that the fungus population was affected more by the addition of borax than was the population of bacteria. Growth of *Trichoderma* was confined almost entirely to the borax-treated soil. The possible use of *Trichoderma* species for a soil test of boron deficiency is suggested.

The data presented indicate that the fixation of boron in limed soils is due, at least in part, to the increased activity of the soil micro-organisms.

The influence of potassium chloride on nitrification in Bedford silt loam. B. E. F. HAHN. (Purdue Univ.). (*Jour. Bact.*, 42 (1941), No. 2, p. 290).—In Bedford silt loam potassium chloride added in concentrations above 360 p. p. m. lowered the nitrate accumulation rate but was shown not to affect recovery of added nitrate nitrogen, not to increase denitrification or nitrate utilization by soil micro-organisms, and not to reduce *Nitrobacter* numbers. *Nitrosomonas* numbers were reduced somewhat. This salt appeared to produce the effect noted by inhibiting oxidation of ammonia to nitrite. The chloride ion was found to be the responsible ion. The effect was greatest at a moisture content of 50 percent of field moisture-holding capacity and did not appear when this figure was above 66 percent.

The importance of sodium for plant nutrition.—II, Effect on beets of the secondary ions in nitrate fertilizers, J. J. LEHR (*Soil Sci.*, 52 (1941), No. 5, pp. 373-379, figs. 2).—In further experiments on this subject (E. S. R., 86, p. 300), the author found the yield of beets substantially higher with sodium than with calcium nitrate. In one experiment NaNO_3 produced increased yields ranging between 47 and 170 percent; in two other experiments increased yields of 65 and 75 percent, respectively, $\text{Ca}(\text{NO}_3)_2$ and $\text{NH}_4\text{NO}_3 + \text{CaCO}_3$ giving approximately equal yields. He concludes that the effect of the secondary ions was as important as the effect of the so-called main component, nitrate. Supplementary field observations indicated that the effect of the secondary ions is most pronounced in weakly buffered, that is, sandy, soils. The effect on clay soils was less, although not negligible from the standpoint of economic fertilizer practice.

Replacement of adsorbed phosphate from kaolinite by fluoride. S. R. DICKMAN and R. H. BRAY. (Ill. Expt. Sta.). (*Soil Sci.*, 52 (1941), No. 4, pp. 263-273).—Quantitative demonstration of the stoichiometric replacement of hydroxyl ions by fluoride is presented. It was also found that complete recovery of added phosphate was obtained by shaking 1 gm. of kaolinite with 50 cc. of 0.1 N neutral NH_4F for 1 min. Continued phosphate-kaolinite contact, drying, and calcium saturation tended to decrease recovery of added phosphate by this method. The possibility of measuring the replaceable phosphate of soils and clays with this reagent is discussed. The authors present data showing that this reagent does not extract phosphate resulting from large additions of rock

phosphate to a soil, and that it extracts only a part of the phosphate included in the easily acid-soluble fraction.

Calcium metaphosphate: Rate of reaction of phosphorus pentoxide with rock phosphate, G. L. FREAR and L. H. HULL (*Indus. and Engin. Chem.*, **33** (1941), No. 12, pp. 1560-1566, figs. 8).—To study the factors affecting the reaction of rock phosphate with P_2O_5 at high temperatures, individual pellets of rock phosphate of various compositions, of fluorapatite, and of lime were suspended in a tube furnace in a stream of gas containing P_2O_5 . The temperature, gas velocity, P_2O_5 concentration, and water vapor concentration were varied. The gain in weight of the specimen was measured, and effects of variations in starting material and in the conditions of reaction were determined.

Sources and distribution of iodine in South Carolina with special reference to types of soil and rocks, J. H. MITCHELL (S. C. Expt. Sta.). (*Soil Sci.*, **52** (1941), No. 5, pp. 365-371, fig. 1).—It is reported that the average iodine content of the soils of the uplands is 3.98 p. p. m., and that of the Coastal Plains is 3.77 p. p. m. There is not a great variation in the iodine content of the 14 individual soils from the Coastal Plains. Of the Coastal Plains provinces, the sand hill soils have the average content, 2.74 p. p. m.; the upper Coastal Plains 5.45; the middle Coastal Plains 4.25; and the lower Coastal Plains 2.66 p. p. m.

Commercial fertilizers report for 1941, E. M. BAILEY (*Connecticut [New Haven] Sta. Bul.* **453** (1941), pp. 37-93+[2]).—This bulletin contains brief explanations of some of the requirements of the Connecticut fertilizer law, together with the registration list of manufacturers and tabulated analytical data for 1941.

AGRICULTURAL BOTANY

A short history of the plant sciences, H. S. REED (*Waltham, Mass.: Chron. Bot. Co.*, 1942, pp. 10]+323, figs. 37).—Pursuant to the stated objective of this book, which "is intended for the average graduate student in our universities, rather than for the specialist in science or in history," the main subject matter is taken up under gardeners and herbalists of antiquity; the nascent period, from the sixth century B. C. to the end of the second century A. D.; the retrogressive period, from the beginning of the third to the end of the twelfth century; the renaissance period, from the beginning of the thirteenth to the end of the sixteenth century; the seventeenth century; the eighteenth century; gardens and other things; plant geography in the nineteenth century; morphology; cytology; the water economy of plants; the fixation of carbon by plants; the assimilation of nitrogen; the fixation and metabolism of nitrogen; plant nutrition; mineral constituents in metabolism; mycology; plant pathology; and significant names in the history of botanical science. Literature references appear at the ends of individual chapters, and an author-subject index is provided.

Canada's contribution to the science of botany, MARIE-VICTORIN (In *A History of Science in Canada*, edited by H. M. TORRY. Toronto: Ryerson Press, [1939], pp. 35-40).—A brief survey of botanical contributions of Canada from 1635 to more recent times.

Botany (In *Bibliography of the Virgin Islands of the United States*, edited by C. F. REID ET AL. New York: H. W. Wilson Co., 1941, pp. 17-24).—Nearly seven pages of references are included.

Abstracts of dissertations presented by candidates for the degree of Doctor of Philosophy, summer quarter, 1940 (*Ohio State Univ., Abs. Doctoral Diss.*, No. 34 (1941), pp. VIII+665, figs. 61).—The following are of botanical interest: Macroscopic Photoperiodic Aftereffects in Various Species of Plants by V. A. Greulach (pp. 173-181); An Anatomical Study of the Seedling of

Chrysanthemum morifolium Bailey, by C. B. Link (pp. 333-339); Seedling Emergence Studies of Small-Seeded Legumes and Grasses, by R. P. Moore (pp. 440-458); The Developmental Anatomy of *Jatropha cordata* (Orteg.) Muell., by R. A. Popham (pp. 485-497); and Responses of Biennial Sweet Clover to Temperature, Moisture, and Length of Day, by T. J. Smith (pp. 563-574).

Abstracts of dissertations approved for the Ph. D., M. Sc., and M. Litt. degrees in the University of Cambridge during the academical year 1939-1940 (*Cambridge, Eng.: Univ. Press, 1941, pp. 117*).—The following are included: The Cytology and Genetics of *Hordeum*, by T.-C. Chin (pp. 13-14); The Respiration of Barley Seedlings in Relation to Oxygen Supply, by D. F. Forward (pp. 17-18); On the Relation Between the Rate of Photosynthesis of *Chlorella vulgaris* and Carbon Dioxide Concentration, by R. Howles (pp. 18-19); and Xeromorphy and Its Bearing on Disease Resistance in Plants, by M. L. R. Pettersson (pp. 19-20).

[**Abstracts of botanical papers**] (*Amer. Jour. Bot.*, 28 (1941), No. 10, pp. 18-198).—Abstracts beginning on the pages indicated are included: Page 1s, A Study of the Inclined Point Quadrat Method of Botanical Analysis of Pasture Mixtures, by A. C. Arny and A. R. Schmid (Minn. Expt. Sta.); A Correlation Between Respiration and Mitotic Periodicity in Plants, by A. V. Beatty; and Cell Growth and Division in a Living Root Meristem [*Phleum pratense*], by H. T. Brumfield. Page 2s, A Discussion of Some Factors Which Influence the Form of the Vascular Bundle in the Monocotyledoneae, by V. I. Cheadle and N. B. Whitford (R. I. State Col.); Effects of Colchicine Upon the Apical Meristem of *Vinca rosea*, by G. L. Cross and T. J. Johnson; and The Root System of Perennial Pepper Grass (Hoary Cress) (*Lipidium draba* L., and J. C. Frazier (Kans. Sta.)). Page 3s, Chromosome Structure in Somatic and Homotypic Chromosomes, by A. R. Gopal-Ayengar; The Breeding Structure of *Bromus carinatus*, Hook. & Arn., by J. R. Harlan (Univ. Calif.); Developmental Studies of the Strawberry Fruit, by A. L. Davis (Ohio Sta.); and Cytogenetic Studies of *Oenothera*, Subgenus *Raimannia*, by A. Hecht. Page 4s, The Present Status of Synapsis and Chiasmotypy, by E. C. Jeffrey and E. J. Huertli; Microsporogenesis in *Juglans intermedia* Carr., by J. W. and H. H. McKay (U. S. D. A.); The Development of Vascular Connections in the Leaf-Sheath of Sugarcane, by C. F. Moreland and L. H. Flint (La. State Univ.); and Chromosome Number Relationships in the Genus *Euphorbia*, by B. A. Perry. Page 5s, Recent Hybrids of *Lilium sulphureum* × *L. henryi*, by N. E. Pfeiffer; Life Cycle of *Polyporus betulinus* (Bull.) Fries., by S. J. Pusateri; Preliminary Cyto-Genetic Studies on Polyembryony in *Asparagus officinalis* L., by T. E. Randall and C. M. Rick (Univ. Calif.); Contribution of the Three Germ Layers to the Formation of Ovules in *Datura stramonium*, by S. Satina and A. F. Blakeslee; The Induction of Polyploidy in *Vinca rosea*, by L. Schnell; and Traumatic Acid and Mitosis in *Ricinus communis*, by F. M. Scott and M. Reynolds (Univ. Calif.). Page 6s, Nuclear Size, in *Echinocystis* and in *Cucurbita*, by F. M. Scott (Univ. Calif.); Development of Adventitious Roots in Stem Cuttings of *Tropaeolum majus* L., by A. I. Smith; Anatomy of the Inferior Ovary in *Darbya* (Santalaceae), by F. H. and E. C. Smith (Oreg. State Col. et al.); and Comparative Growth Rates of Diploid and Autotetraploid *Stipa lepidota*, by G. L. Stebbins, Jr. (Univ. Calif.) Page 7s, The Oxidase System Associated With the Endodermis of Monocotyledonous Plants, by D. S. Van Fleet. Page 10s, The Effects of Various Respiratory Stimulants and Poisons on the Growth of Oat Coleoptiles, by H. G. Albaum, S. Kaiser, C. Guttentag, and B. Elchel; The Growth and Metabolism of Oat Seedlings After Seed Exposure to Oxygen, by H. G. Albaum, J. Donnelly, and S. Korkes;

Surface Relationships of Roots and Colloidal Clay in Plant Nutrition, by W. A. Albrecht, E. R. Graham, and H. R. Shepard (Univ. Mo.); and **Dormancy in Seeds of *Convallaria majalis* L. and *Smilacina racemosa* (L.) Desf.**, by L. V. Barton and E. M. Schroeder. Page 11s, **A Reversible Growth Inhibition of Isolated Tomato Roots**, by J. Bonner; **The Tomato Test for Factors Limiting the Growth of Leaves and of Stems**, by D. Bonner and F. W. Went; and **Effects of Heating at 52° C. on the Respiratory System of Sugarcane**, by J. Dufrenoy (La. State Univ.). Page 12s, **Factors Which Affect Absorption of Water by Seeds**, by H. C. Eyster; **Advantages of a Fourteen-Day Interval of Cultivation for the Control of Field Bindweed, *Convolvulus arvensis* L.**, by J. C. Frazier (Kans. Sta.); **Oxygen Production by Isolated Chloroplasts**, by C. S. French and M. L. Anson (Univ. Minn. et al.); **Influence of Solute Concentration on Intake of Water and Nutrients by Roots of Approach-Grafted Tomato Plants**, by E. M. Long (U. S. D. A.); and **Some Properties of a Growth-Inhibitor Formed by *Chorella vulgaris***, by R. Pratt (Univ. Calif.). Page 13s, **Effect of Acetic Acid on the Respiration of Parts of the Oat Seedling (*Avena sativa*)**, by T. W. Robinson and A. B. Taylor (Univ. Ill.); **The Mineral Pattern of Flowering and Nonflowering Plants as Determined by Micro-Incineration**, by B. E. Struckmeyer (Univ. Wis.); **The Influence of Low Intensity Orange Light on the Response of Peas to Auxin**, by L. A. Thayer; and **Continuous Records of Stomatal Behavior in Field Grown Cotton**, by B. F. Volkerding and D. B. Anderson (U. S. D. A. et al.). Page 14s, **Effects of the Composition of the Soil Atmosphere on the Absorption of Water by Plants**, by J. B. Whitney, Jr.; **An Inexpensive Recording Manometer for Recording Stomatal Movements**, by C. C. Wilson; and **Qualitative Differences in Capacity of Growth Substances To Induce Formative Effects**, by P. W. Zimmerman and A. E. Hitchcock. Page 15s, **The Cacti of the Arizona and California Deserts**, by L. Benson (Univ. Ariz.); **The Floral Distribution of the Balcones Escarpment With Possible Explanations**, by H. B. Parks (Tex. Sta.); and **Natural Vegetational Areas in Texas**, by B. C. Tharp. Page 16s, **Notes of New Mexico Plants**, by A. L. Hershey (N. Mex. Col. Agr.); and **Studies on the Isolated Prairies of Louisiana**, by C. A. Brown (La. State Univ.). Page 17s, **The Weed Impurities Found in Some Seed Samples of Grasses Utilized in Soil Conservation**, by M. P. Mauldin, and **Hybridism, Ecotypes, and Peripheral Race Variants in *Quercus***, by C. H. Muller (both U. S. D. A.); and **A Cytological Basis for Speciation in a Systematic Study of *Polygonatum***, by O. J. Elgstl. Page 18s, **Biosystematy and the Concept of the Species**, by W. H. Camp and C. L. Gilly; **Distribution of some Species of *Cornus***, by H. W. Rickett; **Systematic Relationships of the North American Larkspurs**, by J. Ewan; and **The Geographical Distribution Centers of *Ranunculus* in North America**, by L. Benson (Univ. Ariz.).

[Botanical studies by the Missouri Station] (*Missouri Sta. Bul.* 438 (1941), pp. 56-57, 70-71).—Progress reports by W. C. Etheridge, D. I. Allen, P. R. Burkholder, A. E. Murneek, and A. D. Hibbard are included on concentrations of essential mineral elements on growth of soybean, photoperiodism and enzyme activity in the soybean plant, tests for the possible presence and effects of catalysts (hormones) in sexual reproduction, and the relation of photoperiodic induction to photoperiodic inhibition in *Rudbeckia bicolor*.

[Botanical studies by the Cornell Station] ([*New York*] *Cornell Sta. Rpt.* 1941, pp. 117-119, 123, 124-126, 177).—Brief reports by L. Knudson, O. F. Curtis, D. G. Clark, J. I. Shafer, R. A. Emerson, G. Knaysl, C. N. Stark, K. Anderson, W. A. Seleen, C. F. Nilven, Jr., K. L. Smiley, J. M. Sherman, H. Platenlus, I. C. Gunsalus, D. B. Hand, and E. C. Greisen are included on the following:

Delayed photosynthesis in chlorophyll-bearing embryos of orchids; other studies on orchid seed; influence of X-rays on the growth and metabolism in ferns; translocation of solutes in plants, tissues concerned, and factors influencing the rate and direction of movement; crop improvement through determination of variety and strain differences in effectiveness of specific physiological processes, with special emphasis on photosynthesis; demonstration of the bacterial nucleus; variability of the sporiferous bacteria; validity of the methyl red and Voges-Proskauer tests for differentiating *Escherichia* from *Aerobacter*; green-fluorescent-pigment-producing bacteria; dehydrogenase systems of bacteria, with special reference to the mastitis streptococci; respiratory mechanisms of streptococci; the reduction of riboflavin by streptococci; synthesis of polysaccharides by streptococci; hydrolysis of arginine by streptococci; and the rate and course of respiration in different vegetables, only spinach and potatoes giving unusually low quotients.

[Abstracts of bacteriological papers] (*Jour. Bact.*, 43 (1942), No. 1, pp. 3-62).—Abstracts begun on the pages indicated are included: The Presence of Growth Factors in the Cells of the Autotrophic Sulphur Bacteria, by D. J. O'Kane (p. 7), Detection of Nitrogen Fixation With Isotopic Nitrogen, by R. H. Burris and P. W. Wilson (p. 7), Properties of Hydrogenase in *Azotobacter*, by J. B. Wilson and S. B. Lee (p. 7), and Large Scale Production of *Azotobacter* Cells for the Preparation of Cell-Free Enzymes, by S. B. Lee, R. H. Burris, and P. W. Wilson (p. 60) (all Univ. Wis.); Selective Bacteriostatic and Bactericidal Action of Various Substances of Microbial Origin, by S. A. Waksman and H. B. Woodruff (p. 9), and Incidence of Bacteriolytic Properties Among Actinomycetes, by M. Welsch (p. 10) (both N. J. Expt. Stas.); The Antibacterial Action of Penicillin, by G. L. Hobby, K. Meyer, M. H. Dawson, and E. Chaffee (p. 11); Antibacterial Filtrates From a Strain of *Aspergillus flavus*, by E. C. White and J. H. Hill (p. 12); Comparative Bacteriostatic Activity of Penicillin and Gramicidin, by D. Heilman and W. E. Herrell (p. 12); Bactericidal and Fungicidal Properties of a Crystalline Protein Hydrochloride Isolated From Wheat Flour, by T. H. Harris and L. S. Stuart (p. 14), Quantitative Spectrochemical Analysis of Vegetative and Spore Cells of Aerobic Bacteria, by H. R. Curran, B. C. Brunstetter, and A. T. Myers (p. 25), Simple Technique for the Detection of Melibiose-Fermenting Yeasts, by L. J. Wickerham (p. 42), and The Nomenclature and Characteristics of the *Lactobacillus* Employed for the Microbiological Assay of Riboflavin, by R. P. Tittsler, M. Rogosa, and E. O. Whittier (p. 56) (all U. S. D. A.); A Micro Culture Slide for Fungi, by J. H. Brown (p. 16); The Response of Some Yeasts to Five Different Growth Factors, by L. H. Leonian and V. G. Lilly (p. 17) (W. Va. Univ.); Growth Factor Requirements for Osmophilic Yeasts, by A. G. Lochhead and G. B. Landarkin (p. 18); The Utilization of Hydrocarbons by Bacteria, by R. J. Strawinski and R. W. Stone (p. 18), and The Relationship Between Quality and Bacterial Flora of Virginia Flue-Cured Tobacco, by W. E. Grundy, D. E. Haley, and J. J. Reid (p. 41) (both Pa. State Col.); Studies on Slime Production by Some Members of the Genus *Leuconostoc*, by J. A. Alford and C. S. McCleskey (p. 24) (La. State Univ.); Variability in Acid and Alkali Production by Bacilli Grown on 3 Types of Peptone, by F. S. Orcutt and R. J. Fitzgerald (p. 26) (Va. A. and M. Col.); Variation in Actinomycetes Due to Amount of Inoculum, by K. L. Jones (p. 26); The Isolation of Bacterial Carotenoid Pigments and the Determination of Their Absorption Spectrum Maxima, by B. Sobin and G. L. Stahly (p. 27), and *Serratia marcescens* as a Cause of Pink Sauerkraut, by D. F. Holtman (p. 40) (both Ohio State Univ.); Further Studies on the

Biology of Certain Myxobacteria, by S. F. Snieszko, J. McAllister, and E. R. Hitchner (p. 28) (Univ. Maine); Isolation and Identification of a Sulphur Bacterium From an Industrial Process, by E. M. Norton and O. N. Fellowes (p. 37) (Univ. Tenn.); Comparative Studies of the Growth of *Clostridium thermosaccharolyticum* and *Clostridium sporogenes* in Various Anaerobic Media, by R. M. Stern (p. 38); The Significance of the Incubation Temperature of Recovery Cultures in Determining Spore Resistance to Heat, by O. B. Williams and J. M. Reed (p. 39); A Continuous Process for the Production of Pure-Culture Distillery Yeast, by W. H. Stark, R. E. Sculf, and P. J. Kolachov (p. 42); The Effect of a Vacuum on the Destruction of Bacteria by Germicides, by A. J. Salle and M. Korzenovsky (p. 52) (Univ. Calif.); The Germicidal Properties of High-Molecular-Weight Aliphatic Amine Acetates, by L. A. Harri-man, E. W. Hopkins, and A. Kochler (p. 53); A Stabilized Spore Suspension for Disinfection Tests, by G. R. Weber and M. Levine (p. 53) (Iowa State Col.); Relative Inhibition of Growth of Microorganisms by Glucose and Sucrose Syrups, by L. Tarkow, C. R. Fellows, and A. S. Levine (p. 55) (Mass. State Col.); and The Characterization of Species of the Genus *Lactobacillus*, by C. S. Pederson (p. 56) (N. Y. State Sta.).

Proceedings of local branches of the Society of American Bacteriologists (*Jour. Bact.*, 42 (1941), No. 6, pp. 815-819).—The following are of botanical interest: Bactericidal Substances of Aerobic Sporulating Bacilli, by J. L. Stokes and C. R. Woodward, Jr. (p. 815); and The Distribution of Antagonistic Properties Among Actinomycetes, by S. A. Waksman, H. B. Woodruff, and E. S. Horning (p. 816) (N. J. Expt. Stas.).

Manual of methods: Leaflet II, 8. ed., Preparation of media (*Pure Cult. Study Bact.*, 10 (1942), No. 1, pp. 16).—This is a revision of material on cultivation and storage media, general differential media, organic media for special groups, and synthetic media. There are 18 references.

Report of the committee on bacteriological technic: Progress during 1941, H. J. CONN, J. H. BROWN, V. BURKE, B. COHEN, M. W. JENNISON, J. A. KENNEDY, A. J. RIKER, and C. H. WEBERMAN (*Jour. Bact.*, 43 (1942), No. 1, p. 2).

Value of pigmentation in classifying Actinomycetes.—A preliminary note, H. J. and J. E. CONN. (N. Y. State Expt. Sta.). (*Jour. Bact.*, 42 (1941), No. 6, pp. 791-799).—"There is good evidence that if, instead of recording the color of a culture, one makes a few simple tests as to its solubility in certain reagents and the color assumed by its solutions at differing pH values, one can use pigmentation as a feature sufficiently constant to be of diagnostic value."

Bactericidal substances from sterile culture-media and bacterial cultures, with special reference to the bacteriolytic properties of Actinomycetes, M. WELSCH. (Rutgers Univ.). (*Jour. Bact.*, 42 (1941), No. 6, pp. 801-814).—Bacteriolysis of living gram-positive bacteria by *Actinomyces* sp. appeared to be a complex phenomenon involving the killing of susceptible cells by an ether-soluble substance able to act only with the *Actinomyces* present or after artificial extraction and dissolving of the dead cells either by the bacteriolytic enzyme from actinomycin or by their own autolytic system. A similar explanation may be given for some cases of antagonism exhibited by several proteolytic bacteria. The antagonistic relationship here described is considered a weak "natural" antagonism, since the active substances involved are normally found in pure cultures of the antagonists. It takes an intermediate position between strong natural antagonism and "direct" antagonism, since the presence of the antagonist is generally needed for its manifestations. The presence in sterile media of bactericidal substances precipitated by $(\text{NH}_4)_2\text{SO}_4$ or acidification and extractable by organic solvents suggests that at least a part of the toxic agents

isolated by various workers from bacterial cultures in complex media need not be of bacterial origin.

On the metabolism of bacteria, C. H. WERKMAN and H. G. WOOD. (Iowa Expt. Sta.). (*Bot. Rev.*, 8 (1942), No. 1, pp. 1-68, fig. 1).—Following an introductory section, this monographic review (nine pages of references) considers the adaptive behavior of bacteria, nutrition and growth, autotrophic and heterotrophic bacteria, the mechanism of intermediary metabolism, and heterotrophic assimilation of CO₂.

Occurrence of the aldolase and isomerase equilibria in bacterial metabolism, M. F. UTTER and C. H. WERKMAN. (Iowa State Col.). (*Jour. Bact.*, 42 (1941), No. 5, pp. 665-676, fig. 1).—These enzymes were shown to be present in a preparation obtained from *Escherichia coli* by grinding with powdered glass, and the equilibrium was demonstrated to be independent of substrate concentration but dependent on temperature. The rate at which this equilibrium point was reached depended on enzyme concentration. All the evidence is said to indicate that the bacterial enzymes are identical with those in muscle and yeast, and further confirm the applicability of the Embden-Meyerhof scheme of glycolysis, in principle, to bacterial dissimilation of carbohydrate.

On the use of basic dyes for the demonstration of the hydrolysis of fat, G. KNAYSI. (Cornell Univ.). (*Jour. Bact.*, 42 (1941), No. 5, pp. 587-589).—The principle of using Nile blue for detecting fat hydrolysis is reviewed, and it is shown that its application makes possible the employment of a number of basic dyes for that purpose. The proper use of basic dyes to demonstrate lipolysis by micro-organisms without consequent toxicity is discussed, and two methods are described.

A morphological study of *Streptococcus fecalis*, G. KNAYSI. (Cornell Univ.). (*Jour. Bact.*, 42 (1941), No. 5, pp. 575-586, figs. 3).

Studies on the alcohol tolerance of yeasts, W. D. GRAY (*Jour. Bact.*, 42 (1941), No. 5, pp. 561-574, figs. 2).—Wide differences in alcohol tolerance having been shown among the yeasts studied, it is evident that in selecting a strain for a particular fermentation this factor must be considered to obviate losses in sugar. Such losses may be prevented by determining the tolerance of the strain desired and then adjusting the glucose content of the material to be fermented so that it is not great enough to yield more alcohol than the yeast can tolerate. Temperature is also an important factor to be considered in fermentation work, if maximum yield is to be obtained. It is shown that the Warburg-Barcroft manometer may be used to determine alcohol tolerance. High or low tolerance apparently is not peculiar to any particular genus or species.

The importance of variation in the taxonomy of fungi, W. C. SNYDER and H. N. HANSEN (*6. Pacific Sci. Cong., Calif., 1939, Proc., vol. 4, pp. 749-752*).—Recently accumulated knowledge renders unsatisfactory the taxonomic arrangements of variable fungi which do not account for this factor. In such cases it is believed that a taxonomic scheme should be based on a knowledge of the range of variability morphologically (and also physiologically, where important), of the morphological characters common to all the variants on which to formulate the morphological species limits, and of the biological characters of the species or individuals comprising it which may be of economic or other importance, and on a standardized technic and procedure which could be used throughout the world.

***Leptota morgani*, an unwholesome fungus,** W. T. HORNE and I. J. CONDIR (*Mycologia*, 33 (1941), No. 6, pp. 666-667).—A report of poisoning by *L. morgani*.

Three new varieties and two new combinations in *Citrus* and related genera of the orange subfamily, W. T. SWINGLE. (U. S. D. A.). (*Jour. Wash. Acad. Sci.*, 32 (1942), No. 1, pp. 24-26, figs. 2).—*C. macroptera kerrii* n. var.,

C. reticulata austera n. var., *Murrraya alata hainensis* n. var., *Clausena heptaphylla cngleri* n. comb., and *M. microphylla* n. comb. are described.

Notes on Wisconsin grasses.—II, Muhlenbergia and Sporobolus, L. H. SHINNERS. (Univ. Wis.). (*Amer. Midland Nat.*, 26 (1941), No. 1, pp. 69-73).—A continuation of the series (*E. S. R.*, 85, p. 171).

History of the native vegetation of western Kansas during seven years of continuous drought, F. W. ALBERTSON and J. E. WEAVER. (*Kans. State Col. coop. Univ. Nebr.*). (*Ecol. Monog.*, 12 (1942), No. 1, pp. 23-51, figs. 34).—These studies covered the period 1933-39. The water content of the soil was determined weekly during the growing season, and a record of aerial environmental factors obtained. Reactions of the mixed prairie and short grass vegetation were recorded year by year in scores of permanent, widely distributed quadrats, and by extensive field notes. Details are discussed and illustrated. "Vegetation suffered the greatest losses under heavy dusting and overgrazing. An average basal cover of 1 to 2 percent showed no increase by 1939. This much-depleted type of grassland is of very wide distribution and constitutes a large portion of the vegetation near the center of the dust bowl. Drought, overgrazing, and hordes of grasshoppers have caused great reduction in carrying capacity of the range. Yield of palatable forage in overgrazed pastures is less than 10 percent of that produced in well-managed ones. Where 10 to 12 acres was formerly required to sustain one animal unit, 30 to 50 acres are now needed. Several years with normal or above normal precipitation and with the most judicious range management will be required to restore the former cover of grasses." There are 27 references.

An ecological study of the vegetation of southeastern Washington and adjacent Idaho, R. F. DAUBENMIRE. (*Univ. Idaho*). (*Ecol. Monog.*, 12 (1942), No. 1, pp. 53-79, figs. 19).—In this ecological study, "most of the detailed vegetational analyses concern the two prairie climatic climaxes. The *Agropyron-Poa* association is dominated by grasses of the bunch habit, is vegetatively active in the cool, rainy winter and spring, but remains completely dormant during the hot, dry summer. The *Festuca-Agropyron* association is dominated by perennial forbs, is floristically richer than the other prairie, and has a shorter period of aestivation. The principal edaphic, fire, and biotic climaxes of all three zones are briefly described." There are 29 references.

Vegetation of the Prince William Sound region, Alaska; with a brief excursion into post-Pleistocene climatic history, W. S. COOPER. (*Univ. Minn.*). (*Ecol. Monog.*, 12 (1942), No. 1, pp. 1-22, figs. 14).—The vegetational study concerns the geography, glacial history, and climate; the regional climax, including coastal Alaska in general and interrelations of bog, heath, and forest; and the vegetation of the inner fjords.

Plants of New Zealand, R. M. LAING and E. W. BLACKWELL (*Auckland, New Zeal., and London: Whitcombe and Tombs, 1940, 4. ed., rev., and enl., pp. XVII+499, [pls. 8], figs. [193]*).—A manual of the flora of this unusual botanical region.

The limited numbers of nodules produced on legumes by different strains of *Rhizobium*, H. K. CHEN (*Jour. Agr. Sci. [England]*, 31 (1941), No. 4, pp. 479-487).—Pot experiments with red clover and soybeans were carried on to determine how far the number of nodules developed was a specific character of the strain of *Rhizobium* supplied. The number of nodules per gram of root was found to reach a limit specific to each strain. When two different strains were applied to the root surroundings in succession, the final number of nodules was determined by the limit specific to the strain in contact with the roots while these were making most of their growth. For clover this was the second and for soybeans the first strain applied.

Symbiosis of leguminous plants and nodule bacteria.—II, Further observations on the excretion of nitrogenous substances from nodules, G. BOND (*Ann. Bot. [London], n. ser., 5 (1941), No. 20, pp. 647-660*).—Continuing these studies (E. S. R., 86, p. 302) and using sand cultures of legumes (mostly peas) in experiments carried out both in Scotland and in the United States, some evidence was obtained of excretion of nitrogenous substances in spite of many negative results. In the course of the investigation it was found that climatic factors, fineness of rooting medium, and nature of the containers may affect the amount excreted, and these are discussed in relation to the findings.

Studies in soil relations of species of violets, H. McCULLOUGH (*Amer. Jour. Bot., 28 (1941), No. 10, pp. 934-941, fig. 1*).—From tests on the soil reactions of 14 eastern violet species, a preference for acid soil was found, degree varying with species. Observations on the soil texture and general moisture content preferences, along with information on the general habitat, are presented for each species. From a study of 10 species it became evident that the quality of growth is correlated not with soil acidity alone but with a combination of this and moisture, texture, and fertility.

Bad earth, S. F. TRELEASE (*Sci. Mo., 54 (1942), No. 1, pp. 12-28, figs. 29*).—This article presents briefly the history of knowledge on selenium poisoning, its nature, absorption and accumulation of Se by plants, Se indicator plants, Se converters and soil contaminators, possibility of human injury, control and prevention, and the relations of other minor elements to the nutrition of animals and man.

The use of indicator plants in locating seleniferous areas in western United States.—IV, Progress report, O. A. BEATH, C. S. GILBERT, and H. F. ERPSON. (Wyo. Expt. Sta.). (*Amer. Jour. Bot., 28 (1941), No. 10, pp. 887-900, figs. 10*).—Continuing this series (E. S. R., 84, p. 307), the Se contents of 407 plants, particularly *Astragalus* spp., collected in 11 western States are reported.

An investigation of the effect of zinc sulphate on plants, G. N. DAVIES (*Ann. Appl. Biol., 28 (1941), No. 2, pp. 81-84, figs. 2*).—The author presents experimental evidence of the toxicity of $ZnSO_4$ to plant growth, and its presence in mine dumps is believed to be one reason for the lack of vegetation. Another possible reason suggested is phosphate deficiency, as any phosphate in the soil would combine with Zn and be rendered unavailable to plants. Suggestions for promoting plant growth on these dumps and preventing stream pollution from them are given.

Destructive changes of the protoplasm in the course of lysis in the species *Fusarium*, W. F. ALTERGOT, K. S. LAVYGHINA, and O. P. KUVSHINOVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 31 (1941), No. 3, pp. 286-289, fig. 1*).—"The results of the present investigation show that the lysis of the organism of a fungus is a process affecting and materially altering the nucleo- and lipoproteid complexes of the cell protoplasm."

The chemistry of plant constituents, O. GISVOLD and C. H. ROGERS (*Minneapolis: Burgess Pub. Co., 1941, rev. ed., pp. [7]+XII+392*).—A revised and enlarged edition of the work previously noted (E. S. R., 80, p. 459).

Carbohydrate metabolism in alpine grasses in connexion with the adaptation problems, S. O. GREBINSKY (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 31 (1941), No. 3, pp. 279-281*).—It was found that in the cereals tested (wheat and rye) there are two types of adaptive carbohydrate reaction to chilling when growing in high regions, viz, storage of sugars and storage of hemicellulose-type carbohydrates. In the course of adaptation of cultivated cereals the former weakens and the latter gains in strength. Wild forage grasses growing under the severe conditions of an alpine climate failed to

show the carbohydrate reaction typical of cultivated grasses, which consist of an outstandingly high accumulation of sugars. On the contrary, the wild grasses exhibited an unmistakable predominance of insoluble reserve carbohydrates over the sugars.

Third symposium on development and growth (*Growth*, 5 (1941), *Sup.*, 3. *Symposium Devlpmnt. and Growth*, pp. [2] + 203, figs. 32).—In this symposium (E. S. R., 86, p. 451), the following are of special botanical interest: Developmental Patterns in Simple Slime Molds, by K. B. Raper (pp. 41-76) (U. S. D. A.); and Growth Patterns in Plants, by A. F. Blakeslee (pp. 77-88).

The extraction of growth hormones from plants, F. G. GUSTAFSON (*Amer. Jour. Bot.*, 28 (1941), No. 10, pp. 947-951).—Frozen plant material is ground, then boiled for 1 min. to destroy the enzyme system responsible for the formation of active growth substance from a precursor during the extraction period. This boiling does not destroy the auxin, which is then extracted with ether in the usual way.

Effect of various growth-regulating substances upon several species of plants, D. B. SWARTZ (*Bot. Gaz.*, 103 (1941), No. 2, pp. 366-373).—Neither vitamin B₁ nor naphthaleneacetic acid supplied to chrysanthemums at 0.1 mg. per liter of complete nutrient solution induced apparent growth responses or significant differences in dry weight, but those receiving the same concentration of this acid per liter of minus-K solution increased in dry weight over the controls, indicating some compensation for lack of K. No significant dry weight differences occurred between cosmos plants used as controls and those receiving 0.01 mg. of naphthaleneacetic acid, nicotinic acid, or the latter plus vitamin B₁ in the complete nutrient. Marigolds showed little variation in dry weight when receiving nicotinic acid alone or plus the vitamin, but a significant decrease in total dry weight followed treatment with 0.01 mg. per liter of naphthaleneacetic acid, indicating a retarding effect on growth. None of the cosmos and marigold treatments resulted in visible effects on growth habit or floral initiation.

Some experiments with growth curvatures and growth substances, P. R. BURKHOLDER (*Amer. Jour. Bot.*, 28 (1941), No. 10, pp. 911-921, figs. 5).—It was found that the downward curvatures of dicotyledonous stems and oats coleoptiles supplied with comparatively large amounts of growth substances are not true instances of reversed geotropism. Such curvatures appear to be related to the availability of growth substance, plastic extensibility of the cells, and the forces applied to the plant organ. Growth responses of oats coleoptiles to stimulation by unilateral light and gravity may be either completely stopped or considerably modified by synthetic growth substances. The extent of phototropic curvature was not altered appreciably by variations between 30° and 165° in the angle of incidence of strong unilateral light continuously applied for 80 min. The amount of geotropic curvature during a comparable short period depends on the direction of the stimulus of gravity. Compensation experiments with light and gravity indicated a difference in reaction time for photoperiodism and geotropism, and the response seems to be modified by changes in sensitivity of the tissues during the stimulation period.

Polarity of auxin transport in inverted Tagetes cuttings, F. W. WENT. (U. S. D. A. et al.). (*Bot. Gaz.*, 103 (1941), No. 2, pp. 386-390, fig. 1).—In inverted cuttings which had developed roots at their original apices and shoots near their bases, the original polar auxin transport persisted, but an additional new auxin transport from the original bases toward the apices developed. The first indication of this reverse transport occurred 3 weeks after starting the inverted cuttings, and after a month both normal and inverse transports occurred simultaneously in the inversely functioning part of the stems.

Physiological and chemical responses of bean and tomato plants to alpha naphthalene acetamide and phenylacetic acid, C. L. HAMNER. (U. S. D. A. et al.). (*Bot. Gaz.*, 103 (1941), No. 2, pp. 374-385).— α -naphthaleneacetamide in the nutrient solution resulted in less top growth and increased root growth, in increased relative percentage contents of Ca, P, and N, and in earlier matured and more extensive xylem and phloem in the roots of Red Kidney bean plants. Spraying the tops with the acetamide did not increase the Ca or P in top leaves or stems or increase the dry weight of the plants. Phenylacetic acid similarly supplied failed to increase the total dry weight of the bean plants significantly, but it apparently increased the top and root growth of young Bonny Best tomato plants, though the evidence here was inconclusive.

A preparation from yeast that is active in breaking the rest period of buds, J. D. GUTHRIE (*Contrib. Boyce Thompson Inst.*, 12 (1941), No. 3, pp. 195-201).—A procedure is given for obtaining a preparation from yeast that is much more active than glutathione and contains adenine, pentose, and P. It also hastened the reduction of methylene blue by potato juice plus glutathione. Experiments indicated that adenine has some dormancy-breaking action.

Synthetically produced substance B, C. L. WORLEY. (Univ. Ga.). (*Bot. Gaz.*, 103 (1941), No. 2, pp. 391-396).—Commercial filter paper contains a water-soluble cofactor for *Aspergillus niger* and *Rhizopus suinus* which is possibly metallic in nature and tends to be toxic to the vegetative growth of *R. suinus* if used singly. The cofactor enters into synthetic formation of a growth factor of the substance-B group when autoclaved with an organic NH₄ salt and sugar. Substance B may be an organic salt of some trace element.

Effect of vitamins on growth of radish and cauliflower, E. C. MINNUM. (Cornell Univ.). (*Bot. Gaz.*, 103 (1941), No. 2, pp. 397-400).—Potted plants in quartz sand with Hoagland's nutrient solution plus minor elements furnished the basic treatment, other techniques used being described in detail. The vitamin treatments of the radish plants included pure crystalline B₁, B₂, and B₆ and Vita Flor (a commercial product said to contain 0.1 percent B₁, 0.5 percent nicotinic acid, and traces of B₂, B₆, and pantothenic acid). The cauliflower treatments were with B₁ and two temperatures and day lengths. Though some individual radish treatments resulted in increases, none was significantly greater than in the controls and no treatment, even up to 10 mg. vitamin per pot, had a significantly depressing effect. In fact, this large amount appeared to have no effect, either beneficial or detrimental. Cauliflower growth was steady at both temperatures and day lengths, and in neither case were there significant differences between the treated and the control plants.

Thiamin content of agar, D. DAY (*Bul. Torrey Bot. Club*, 69 (1942), No. 1, pp. 11-20, fig. 1).—Different kinds of agar were found to vary in thiamin content, but it could be largely or completely removed by leaching with 5 percent aqueous pyridine. Electrodialysis proved no more efficient than this method in purifying agar. Cheesecloth, tobacco cloth, and filter paper also contained appreciable amounts of thiamin, as measured by the growth of *Phycomyces blakesleeanus*. Washing agar, filter paper, and cheesecloth with distilled water removed some of the thiamin. Demonstration of thiamin in these frequently used materials emphasizes the need for care in laboratory technic.

Effect of temperature and time on the X-ray sensitivity of maize seeds, L. R. MAXWELL, J. H. KEMPTON, and V. M. MOSLEY. (U. S. D. A.). (*Jour. Wash. Acad. Sci.*, 32 (1942), No. 1, pp. 18-24, fig. 1).—Dry corn seeds held at from -187° to 50° C. during exposure to X-rays (dosage 35 kr. (kiloroentgen)) exhibited a maximum sensitivity in the region of 0° to room temperature. To decrease this sensitivity by hot or cold treatments, the high or low temperatures must, in general, prevail during irradiation. Cold treatments after

irradiation increased the effects of the X-rays in an apparently additive manner, and heat treatments before irradiation increased the X-ray sensitivity. Time elapsed between irradiation and planting resulted in the following: A general but varying amount of recovery followed with time for all treatments used, the marked reduction in sensitivity of seeds heated during irradiation as compared to "after" or the "irradiated controls" finally disappeared by the end of 69 or 83 days, and seeds heated before irradiation, though recovering with time, were consistently the most susceptible to irradiation.

Effect of photoperiod and temperature on development of barley, H. A. BORTHWICK, M. W. PARKER, and P. H. HEINZE. (U. S. D. A.). (*Bot. Gaz.*, 103 (1941), No. 2, pp. 326-341, figs. 2).—Four lots of barley seedlings were grown on 16-hr. photoperiod at 65° F. to four different ages, respectively, each lot was divided into three groups and continued for another week under the same light and photoperiod conditions but at three different temperatures, and then all were removed from the control rooms and transplanted outdoors for final differential photoperiodic treatment, details of which are fully described. The following results were obtained: Delay in awn emergence followed the 12-hr. day and low temperature applied to the seedling stage, and the younger the seedling the greater was this delay. However, typical temperature aftereffects were not observed, the low temperature affecting the growth rate only during its application. Plants on the 12-hr. day formed no fertile seeds, but produced more dry weight than those on longer photoperiods. The 16-, 20-, and 24-hr. days resulted in lighter plants but all were fertile, and among these three lots the best yields in number and weight of seeds were from those on the 16-hr. day. The differences resulting from these photoperiodic treatments are attributed to the influence on the plants of low-intensity supplemental light.

The effect of light on growth habit of plants, D. G. LANGHAM (*Amer. Jour. Bot.*, 28 (1941), No. 10, pp. 951-956, figs. 6).—Field and laboratory studies indicated that many of the usually prostrate common plants are negatively phototropic to sunlight and positively so to low light intensity. It is concluded that negative phototropism to high-intensity light is probably the cause of the prostrate growth habit. A freak type of rice, corn, and teosinte known as "lazy," which becomes prostrate in the field, is also negatively phototropic to high light intensity. All of the plants used in this study were negatively geotropic in darkness. Lazy teosinte is negatively geotropic in darkness, but lazy corn and rice are ageotropic. The simple mendelian inheritance of the mutant form of rice, corn, and teosinte is evidence that, from a genetical standpoint, the essential difference between the erect and prostrate growth habits in plants is a simple one, suggesting that mutation from one to the other of these habits probably occurs occasionally in many plants. Its frequency might be increased through treatment of seeds or pollen by X-ray or ultraviolet irradiation. The mutant form could be readily detected if the plants were widely spaced and kept under high light intensity.

The effect of red light on growth of the *Avena* seedling, with special reference to the first internode, C. L. SCHNEIDER (*Amer. Jour. Bot.*, 28 (1941), No. 10, pp. 878-886, figs. 12).—It is concluded from this study of growth inhibition of the mesocotyl that if there is an indirect mechanism involving the mediation of another part of the plant this can scarcely be via auxin. Using the "section test," it was shown that mesocotyl growth is a function of auxin concentration and is independent of added sugar. Growth of sections continued only a few hours after isolation of the sections, was more active the younger the seedlings, and was more vigorous in sections from just beneath the coleoptile node. It was demonstrated that there is a direct mechanism for inhibition of mesocotyl growth by red light, i. e., the mesocotyl can act as

its own receptor of the light stimulus. Growth of the young coleoptile was stimulated by red light, but if its tissue was not exposed to light its growth rate was eventually accelerated autonomously without light. The coleoptile growth-stimulation mechanism, too, is a direct one, i. e., the coleoptile can act as its own receptor of the stimulus. At least one major phase of the reciprocal light-growth relationship of the mesocotyl and the coleoptile is thus made up of two oppositely directed and independent responses. The capacities for inhibition and stimulation of mesocotyl and coleoptile are apparently not exclusive properties of these organs, respectively, but common properties that are highly developed, each in the given organ. There are 16 references.

Effect of nutrition and age upon rate of development of terminal staminate inflorescences of *Xanthium pennsylvanicum*, A. W. NAYLOR (*Bot. Gaz.*, 103 (1941), No. 2, pp. 342-353, figs. 3).—The detailed data presented are believed to substantiate the theory that the presence of leaf tissue other than that being photoperiodically induced decreases the effectiveness of the flower-promoting stimulus in bringing about floral initiation and the subsequent rate of development. There are 20 references.

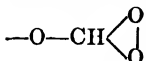
Über den hemmenden Einfluss der Blätter in der photoperiodischen Reaktion der Pflanzen [The inhibitory influence of leaves on the photoperiodic reaction of plants], A. LANG and G. MELCHERS (*Naturwissenschaften*, 29 (1941), No. 5-6, pp. 82-83).—This is a brief review (15 references) and summary of experiments by the authors. In the long-day plant *Hyoscyamus niger*, it was found that after cold induction treatment the presence of leaves was not necessary for blossom formation, anlage of which developed independently of day length and even in complete darkness. The nonappearance of blooms in *Hyoscyamus* plants on short day given the cold induction treatment depended on an inhibitory effect of the short photoperiod acting through the leaves.

Absorption of light by chlorophyll solutions, G. MACKINNEY. (Univ. Calif.). (*Jour. Biol. Chem.*, 140 (1941), No. 2, pp. 315-322, fig. 1).—The author calls attention to the effect of solvent on the absorption coefficients of chlorophylls *a* and *b*. Values obtained in anhydrous ether and anhydrous acetone may now be compared with similar values in methanol, U. S. P. ether, and aqueous acetone. It is also possible to account for the entire absorption, in the region examined (6,800-4,250 a. u.), of crude leaf extracts from *Avena* and *Malva* in aqueous acetone, with dried solid chlorophyll components, dissolved in acetone and made to volume with solvent of identical composition with the extract, at 6,800-5,400 a. u. The divergence at 5,400-4,250 a. u. is believed to be solely carotenoid in character. In view of this it is thought that the chlorophylls described by Willstätter and Stoll are artefacts only in the sense that they have been liberated from the pigment-protein complex termed chloroplastin.

Über den Chlorophyllgehalt autopolyploider Pflanzen [The chlorophyll content of autopolyploid plants], K. FIRSCHLE (*Naturwissenschaften*, 29 (1941), No. 3, pp. 45-46).

Number of chlorophyll components, F. P. ZSCHEILE. (Ind. Expt. Sta.). (*Bot. Gaz.*, 103 (1941), No. 2, pp. 401-403).—It is concluded from this review of work by the author and others (9 references) that the earlier observations on component *c* resulted from the decomposition of chlorophyll *a* to pheophytin *a* and of the fact that the chromatographic methods employed were inadequate to separate them. After considering more recent results it is believed that both the use of talc and the long-time preparation required in the earlier method were factors which could have caused the formation of pheophytin *a*. The advantage and usefulness of the spectrophotometric method were demonstrated as means of control during chromatographic separations.

Zur Frage des Chemismus der Photosynthese, N. N. OWTSCHINNIKOW (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 31 (1941), No. 2, pp. 163-164*).—According to the experimental results, the catalase of etiolated wheat leaves is less effective than that of green leaves, indicating that the catalase of photosynthesis is not identical with that of respiration. These two enzymes are differentiated by their effects on the energy of activation. Furthermore, the Willstätter and Maquenne hypothesis of the presence of the peroxide form



in photosynthesis is indirectly confirmed through the effective catalase in the photosynthetic process and through the less effective catalase in that of respiration.

Carbon dioxide exchange and the measurement of the quantum yield of photosynthesis, R. EMERSON and C. M. LEWIS (*Amer. Jour. Bot., 28 (1941), No. 9, pp. 789-804, figs. 6*).—The error introduced by irregularities in CO_2 exchange during short periods of light and darkness in quantum yield measurements by the Warburg-Negelein method seems to be due to a physiological system present in the cells which exchanges large amounts of CO_2 in response to darkness and illumination. The dependence of this exchange on external conditions is so different from that of photosynthesis and respiration on the same conditions that it appears possible a physiological system apart from what is ordinarily regarded as respiration and photosynthesis is responsible for the deviations from expected CO_2 exchange. Because of these irregularities in CO_2 exchange, O_2 exchange is a more reliable measure of the photosynthesis rate over short periods. The quantum yield of photosynthesis based on O_2 exchange has a maximum value of about 0.10 instead of the values of 0.25-0.33 formerly found by the Warburg-Negelein method. Conditions previously believed important in leading to high quantum yields were found to be of relatively little significance for yields based on O_2 exchange alone. A yield of about 0.10 was characteristic of *Chlorella* cells over a wide range of conditions. Closely similar values were obtained with 11 other species of organisms.

Scientific apparatus and laboratory methods, R. E. GIBSON (Purdue Univ.). (*Science, 95 (1942), No. 2453, pp. 25-26, fig. 1*).—A simple, efficient, and inexpensive vessel for CO_2 absorption, constructed successfully and extensively used for plant respiration measurements, is described and illustrated.

"Crossed fibrillar" structure of plant cell walls, R. D. PRESTON (*Nature [London], 147 (1941), No. 3736, p. 710*).—A brief review of pertinent data, with 10 references.

Contributions to the chemistry of the plant cell wall, W. M. HARLOW (*Paper Trade Jour., 112 (1941), No. 23, pp. 31-34, figs. 4*).—The failure of certain cells in delignified thin sections of wood to separate is "accounted for on the not unreasonable assumption that during growth the intercellular substance becomes so attenuated in places that the primary walls occasionally make contact with each other." In stain tests the lignified walls in some plant species appeared to have an affinity for safranin, whereas cellulose walls adsorbed light (or fast) green more readily. Other species cannot be placed in this category, since the cell walls may stain entirely red, or entirely green, and some may show both colors in the same wall. "The combination used in this study evidently comes nearer to satisfying the requirements of true microchemical staining than others thus far investigated, but one would indeed be rash to draw any sweeping conclusions as to the value of even this combination."

Formation of microscopic cellulose particles in colorless plastids of the cotton fiber, W. K. FARR (*Contrib. Boyce Thompson Inst., 12 (1941), No. 3, pp. 181-194, figs. 9*).—It was found that native cellulose particles are formed

in the colorless plastids of living cotton fibers by a process essentially similar to that of mercerized cellulose particles in the chloroplasts of *Halicystis* (E. S. R., 82, p. 745; 86, p. 167). These physical aspects of cellulose formation have no apparent points in common with the process of starch formation either in chloroplasts or in colorless plastids in cotton. Within very young plastids (colorless or pigmented) no structural features were observed that would indicate the type of crystalline carbohydrate to be produced. Cells of cotton leaves, stems, and boll walls carry on the formation of these two closely related carbohydrates, starch and cellulose, simultaneously, in separate plastids.

X-ray studies regarding the formation and orientation of crystalline cellulose in the cell wall of *Valonia*, W. A. Sisson (*Contrib. Boyce Thompson Inst.*, 12 (1941), No. 3, pp. 171-180, figs. 2).—This marine alga was examined with special reference to the inner liquid cytoplasm, the surrounding layer of viscous cytoplasm, and the outer limiting cellulose membrane, crystalline cellulose being found in all three. It is concluded that the cellulose chain molecules are arranged parallel to the long axis of the particle, and that the crystalline regularity of the particle approaches that of a single crystal.

Comparative studies on the structure of the shoot apex in seed plants, A. S. FOSTER. (Univ. Calif.). (*Bul. Torrey Bot. Club*, 68 (1941), No. 6, pp. 339-350, figs. 4).

Recent advances in direct methods of testing viability of tree seeds, H. I. BALDWIN (*N. H. Acad. Sci. Proc.*, 1 (1941), No. 3, pp. 19-20).—An abstract.

A comparison of two methods of determining the diffusion pressure deficit of potato tuber tissues, B. S. MEYER and A. M. WALLACE (Ohio State Univ.). (*Amer. Jour. Bot.*, 28 (1941), No. 9, pp. 838-843, figs. 3).—The volumetric and gravimetric methods gave virtually identical results, and there was little difference whether the tissue cylinders remained immersed in the solutions for 5 or for 24 hr. Loss of solutes to or gain of solutes from the solutions in which the cylinders were immersed did not introduce an appreciable error into measurements by either method.

GENETICS

Proceedings of the Seventh International Genetical Congress, Edinburgh, Scotland, 23-30 August, 1939 (*Cambridge, Eng.: Univ. Press*, [1941], pp. [6]+336, figs. 34, pls. 6).—The report of this congress includes the minutes of the official meetings and abstracts of papers presented before the nine sections regarding gene and chromosome theory, X-rays, and mutations; cytology and cytological analysis; physiological genetics, including the influence of color genes and hormones and sex determination; animal breeding and inbreeding for livestock improvement in the light of genetics for different geographical locations, especially the Tropics, and artificial insemination, milk yield, nutrition, and genetics of cattle, sheep, swine, poultry, and small animals; plant breeding and cereal production in the light of genetics; human genetics and blood groups; genetics in relation to evolution and systematics, including polyploidy, etc.; statistical genetics; and genetical aspects of growth. Accounts were also given of group meetings on statistics in relation to genetics, plant breeding methods, and mouse genetics.

Genetics and the origin of species, T. DOBZHANSKY (*New York: Columbia Univ. Press*, 1941, 2. ed., rev., pp. XVIII+446, figs. 24).—This is a revision of the book previously noted (E. S. R., 78, p. 467), with special reference to the origin of species through hybridization, polyploidy, and adaptation to environmental conditions.

The Merton catalogue: A list of chromosome numbers of British plants, Supplement I, J. P. RUTLAND (*New Phytol.*, 40 (1941), No. 3, pp. 210-214, figs. 19).—Contains addenda to the catalog previously noted (E. S. R., 83, p. 606).

Mutation in *Drosophila*, bacteria, and viruses, J. W. GOWEN. (Iowa Expt. Sta.). (In *Cold Spring Harbor Symposia on Quantitative Biology*, IX. *Cold Spring Harbor, N. Y.: Biol. Lab.*, 1941, vol. 9, pp. 187-193, fig. 1).—Spontaneous variation in morphological and cultural characters and effects of organisms of the causative agents of the bacterial corn wilt disease and tobacco mosaic were found to be small. Likewise, mutations of *D. melanogaster* were relatively rare. The frequency of all variations was accelerated by X-ray exposure, the rate depending on the amount of exposure. From the greater tendency of energy to cause inactivation than mutation, it is considered that more of the molecular arrangement is significant to reproduction of the molecule than to the phenotypic expression of the character.

Venturia inaequalis (Cke.) Wint.—I, A groundwork for genetic studies, G. W. KERR and M. H. LANGFORD. (Univ. Wis.). (*Amer. Jour. Bot.*, 28 (1941), No. 9, pp. 805-820, figs. 10).—The 8 ascospores from each of 4 asci of *V. inaequalis* were isolated with record of their serial order in the ascus and cultured under standardized conditions by successive single-spore transfers on malt agar plates. On the basis of colony characters, the 8 isolates of each set composed 4 groups, each consisting of a pair of like isolates. Each of the 16 pairs was distinguishable from every other pair by colony characters, but the 2 members of any pair were indistinguishable by any test tried. All the lines exhibited a high degree of constancy of differential culture characters over the 3-yr. period under study. The fungus was readily bred in plates of malt agar containing an apple leaf decoction, the latter shown to contain a thermostable organic component stimulative to fertile perithecial development. The isolates were all hermaphroditic and self-incompatible. The 32 isolates of the 4 sets tested comprised 2 groups of 16 (4 to each set), which were intragroup incompatible and intergroup compatible.

In tests of the 32 isolates on leaves of 9 apple varieties, all 8 isolates of each set incited typical sporulating lesions on one or more varieties, whereas on other varieties certain isolates incited sporulating lesions and others did not. On differential varieties, 4 isolates of a set usually incited typical lesions and the other 4 incited flecks. In general, the 32 lines showed no distinct trend toward either gain or loss in pathogenicity during the 3-yr. period. Sector lines investigated showed culture characters and pathogenic reactions differing from those of the lines from which they sprang. These remained comparatively constant throughout the period, and in no case did a sector line revert to the type from which it rose. The results reported in this and other papers indicate that the third nuclear division in the ascus is equational, and that segregation of factors for pathogenicity and sexual compatibility, respectively, may occur alternately in the first or second nuclear division. This is the first case known to the authors in which segregation for pathogenicity has been experimentally demonstrated for an Ascomycete.

Cromosômos do gênero *Gossypium*.—II, Algodoeiro Moco [Chromosomes of the genus *Gossypium*.—II, Moco cotton], O. C. GÓES (*Arg. Serv. Florest.*, 1 (1941), No. 2, pp. 5-8, pls. 3; *Eng. abs.*, p. 7).—On the basis of the chromosome number (26 haploid) found in the Moco variety of northeastern Brazil, the author believes it should be grouped with the American cottons and affiliated with one of the species *G. hirsutum*, *G. purpurascens*, or *G. barbadense*.

Fertile tetraploids of sesame, *Sesamum indicum* Loew, induced by colchicine, D. G. LANGHAM (*Science*, 95 (1942), No. 2460, p. 204).—The average in-

crease in size of seeds obtained by colchicine-induced doubling of the chromosome number was 56 percent. By subsequent treatment, hybridization, and selection, haploids, diploids, triploids, tetraploids, hexaploids, and octoploids were obtained.

A natural amphidiploid from an onion species hybrid, *Allium cepa* L. × *Allium fistulosum* L., H. A. JONES and A. E. CLARKE. (U. S. D. A.). (*Jour. Hered.*, 33 (1942), No. 1, pp. 25-32, figs. 4).—A fertile amphidiploid obtained from a cross of the Australian Brown onion with the Nebuka type of *A. fistulosum* developed greater vegetative vigor than either parent and was perennial in habit like the Nebuka parent. The haploid number of chromosomes in the amphidiploid was 16, and meiotic behavior was fairly regular. During meiosis both the random and localized type of chiasma formation were found in the different bivalents in the same cell. Second-generation plants were very uniform in appearance and set seed readily.

- The nature of the series of environmental variances and the estimation of the genetic variances and the geometric means in crosses involving species of *Lycopersicon*, L. POWERS. (U. S. D. A.). (*Genetics*, 27 (1942), No. 1, p. 162; also in *Genet. Soc. Amer. Rec.*, 10 (1941), p. 162).—Weights of individual fruits were recorded for a cross of the Denmark and Red Currant tomato. The environmental variances were found to be functions of the means and to form a geometric progression. A method of using the genetic variance to obtain a correction factor for subtraction from the theoretical geometric mean used in studying the nature of the interactions of the genes affecting fruit weight is outlined. With the use of this factor, it was evident that the data for the cross were in agreement with the hypothesis that the effects of the genes differentiating fruit weight are geometrically cumulative.

Polyploidy in *Diospyros virginiana* L., J. T. BALDWIN, JR., and R. CULP (*Amer. Jour. Bot.*, 28 (1941), No. 10, pp. 942-944, figs. 5).—This phenotypically variable persimmon has two chromosome races— $2n=60$ and 90. The distribution of the races is discussed and their horticultural importance suggested.

Pollen-tube growth studies in cherries, T. RAPTOPOULOS (*Jour. Genet.*, 42 (1941), No. 1-2, pp. 73-89, pl. 1, figs. 7).—The tetraploid cherry *Prunus cantabrigiensis* was found self-compatible, but attempts to self triploids failed, in part due to the high sterility of the pollen and in part to the deformation of the styles and the presence of opposing factors for incompatibility. Both the style and the stigma were active in resisting incompatible pollen tubes. The growth rate of the compatible pollen tubes accelerated on the third and fourth day after pollination, while that of the incompatible tubes was greatly decreased and in many cases may be arrested completely in the stylar tissue at this time. Crosses between tetraploids and diploids were more successful when the tetraploid was the ovule parent.

Chromosomes and fertility of cherries and their hybrids, T. RAPTOPOULOS (*Jour. Genet.*, 42 (1941), No. 1-2, pp. 91-114, pls. 2, figs. 12).—The duke and sour cherries are concluded to be autotetraploids, the former with a high chiasma frequency and a high percentage of quadrivalents and the latter low in both of these respects. The triploid hybrids of duke × *Prunus avium* and sour × *P. avium* behaved as autotetraploids. It is believed that the duke cherry is an autotetraploid form of *P. avium*, and that the sour cherry is an autotetraploid arising not from *P. avium* but from a postulated species separated from *P. avium* by certain morphological differences but having a common ancestry with it. An inverse relation was observed between the number of quadrivalents and the fertility in nine species and varieties of tetraploid cherries.

The endosperm as a barrier to interspecific hybridization in flowering plants, D. C. COOPER and R. A. BRINK. (Univ. Wis.). (*Science*, 95 (1942), No. 2455, pp. 75-76).—Recent studies in the authors' laboratory are said to indicate that the primary cause of hybrid seed collapse is weak growth of the endosperm, the effect, however, being indirect. This idea, with pertinent data from the literature, is discussed, with the conclusion that "the limits within which plant breeders may be able to explore the possibilities of interspecific hybridization now appear, therefore, to be significantly broader than earlier could have been foreseen."

Sterility differences between auto- and allo-tetraploid *Antirrhinum*, A. H. SPARROW, M. L. HUTTLE, and B. R. NEBEL. (N. Y. State Expt. Sta.). (*Genetics*, 27 (1942), No. 1, p. 170; also in *Genet. Soc. Amer. Rec.*, 10 (1941), p. 170).—Autotetraploids of 15 varieties obtained by treatment of young seedlings with 0.16 percent colchicine set very few seed and, with the exception of one variety, continued highly sterile in the second and third generations. Allotetraploids, obtained by crossing the various autotetraploids set an abundance of seed. Observations of the two types of seedlings showed that the sterility differences could not be attributed merely to meiotic irregularities or to pollen deficiencies.

Two colchicine-induced polyploids of the greenhouse chrysanthemum and their progeny, C. WEDDLE. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 658-660).—Two tetraploid plants, obtained by treating diploid seedlings with colchicine, are described with respect to anatomical and macroscopic features and as to the characteristics of the progeny obtained by self-fertilization.

Chromosome number and hybridization in gladiolus, R. BAMFORD. (Md. Expt. Sta.). (*Jour. Hered.*, 32 (1941), No. 12, pp. 418-422, figs. 3).—As a result of crossing studies in which a large number of species and forms of gladiolus were used, the author reports that hybrids can be made between species representing the limits of the genus, as measured by chromosome number. Comparative success was less as such limits were approached. Some of the triploids and pentaploids were fertile, and aneuploids were obtained which produced progeny. The heteroploid nature of the gladiolus was thus confirmed and extended.

Distribution of structural hybrids in *Paeonia californica*, J. L. WALTERS and G. L. STEBBINS, JR. (Univ. Calif.). (*Genetics*, 27 (1942), No. 1, p. 174; also in *Genet. Soc. Amer. Rec.*, 10 (1941), p. 174).—The species, native to central and southern California, was found to include structurally homozygous forms, with five pairs at the first metaphase, as well as structural heterozygotes showing all possible degrees of heterozygosity. No difference in external morphology was evident between homozygous and heterozygous forms. The homozygous forms occupied a large area in the center of the range of the species, but were absent from the southern and northern ends of the range. Colonies containing both forms were found within the area occupied by the homozygotes.

Cytological irregularities induced in *Petunia* by X-ray treatment of pollen, C. M. RICK. (Univ. Calif.). (*Genetics*, 27 (1942), No. 1, p. 164; also in *Genet. Soc. Amer. Rec.*, 10 (1941), p. 164).—Pollen of diploid petunias exposed to X-ray doses as high as 50,000 roentgen rays functioned to produce viable seed. No haploid plants were obtained from any of the treatments. Of 33 plants found to have gross chromosomal deviations including inversion, translocation, duplication, and deficiency, one-third were chimeras in which the chromosome condition of the pollen mother cells differed, usually in the presence or absence of a fragment chromosome, from that of the roots. Two monosomics, found of special interest, are described as to the behavior of the chromosomes in meiotic division.

Crossing relations of some diploid and polyploid species of roses, J. C. RATSEK, W. S. FLORY, JR., and S. H. YARNELL. (Tex. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 637-654).—In a study involving about 6,000 pollinations it was found that pentaploid roses, as a group, were the most fertile seed parents, followed by tetraploids and diploids on about a par. No effect of apomixis was noted on the results of pentaploid crosses. The potential value of a seed parent was but little affected by having its chromosome number equal to, or larger or smaller than, that of the pollen parents. Tetraploids were somewhat the most valuable pollenizers as a group. Hexaploids and octoploids were promising as pollenizers but poor seed groups. The results suggested a greater possibility of successful crosses between species belonging to the same taxonomic section than to different sections.

Animal breeding in relation to environmental conditions, J. HAMMOND, J. EDWARDS, and A. WALTON (*Jour. Roy. Agr. Soc. England*, 102 (1941), pp. 156-170, figs. 11).—A summary of the influence of environmental conditions, particularly feeding, on meat and milk production in cattle, sheep, and swine and on body size in these animals and horses showed that the desired characteristics could be developed and improved by providing optimum conditions.

[Experiments in animal breeding and physiology of reproduction by the Missouri Station] (*Missouri Sta. Bul.* 438 (1941), pp. 25-26, 26-30, 37, figs. 2).—Results of the following investigations are briefly presented by L. A. Weaver, R. Bogart, D. T. Mayer, F. N. Andrews, F. P. McKenzie, D. W. Colvard, V. Berliner, R. Steensma, E. Gahley, M. Heck, J. Lasley, V. Warbritton, A. C. Ragsdale, H. A. Herman, and C. W. McIntyre: Reciprocal crosses of Duroc-Jersey and Poland China swine; improvement of three inbred lines of Poland China swine; inheritance of shade of red in Duroc-Jersey swine; a chemical test for pregnancy in the mare; a method for concentrating the gonadotropic hormone from pregnant mare serum; the effects of reduced summer temperature and intensive sexual activity on the breeding capacity of rams; artificial insemination in sheep and artificial insemination equipment for horses, cattle, sheep, and swine; the storage of bull and ram semen; ovarian changes in ewes during oestrus and ovulation, and spermatogenesis and sperm morphology in the ram; chromosome counts in cattle, sheep, and swine; artificial breeding of dairy cows; and breeding studies in the station Jersey herd and the development of a high production strain.

[Investigations in the physiology of reproduction and animal genetics by the Cornell Station] ([*New York*] *Cornell Sta. Rpt.* 1941, pp. 101, 103-104, 106-107, 164-167).—Results are given briefly of investigations by S. A. ASDELL, R. Bogart, G. Sperling, F. I. Elliott, M. G. Fincher, G. W. Salisbury, E. L. Willett, C. S. Hobbs, E. S. Harrison, E. S. Savage, J. P. Willman, I. C. Gunsalus, F. B. Hutt, J. H. Bruckner, R. K. Cole, C. D. Mueller, L. F. Dziedziec, A. L. Romanoff, W. T. Lamoreux, and D. G. Jones on the influence of the rate of breeding on the ability to reproduce in rats; the use of hormones in combating sterility in cattle; the relation between the corpus luteum and the uterus; the preservation of stored semen and the development of methods of increasing the usefulness of artificial insemination in the field; genetic resistance to poultry diseases, including tumors, fowl paralysis, and pullorum; the occurrence of mutations in the fowl, such as defective development of feathers and black-and-white pattern, and their linkage with other genes; sex-linked early maturity in fowls; aberrant plumage colors in the pheasant; early detection of infertile eggs; genetic selection for high and low fecundity in the fowl; hereditary chondrodys trophy in the fowl; the influence of low environmental temperatures upon fertility; and the relation of light on semen production in the fowl.

Marsupials and the evolution of mammals, A. A. ABBIE (*Austral. Jour. Sci.*, 4 (1941), No. 3, pp. 77-92, figs. 3).—Variations and fluctuations observed in different marsupials and their possible role in evolution were discussed.

Leopard spotting and color alteration in that recently established breed of horses, the Colorado Rangers, H. GIBBON (*Jour. Colo.-Wyo. Acad. Sci.*, 3 (1941), No. 1, p. 48).—The Colorado Ranger horse was found to possess leopard spotting of any color associated with dark body and white hips. A rapid fading was associated with light circles about the eyes but did not affect the leopard spots, although dark areas and solid color coats influencing even tail and mane colors were noted.

Zebu (Brahman) cross cattle and their possibilities in North Australia: Co-operative investigations in Queensland.—Progress Report No. 5, R. B. KELLEY (*Austral. Council Sci. and Indus. Res. Prog. Rpt.*, 5 [1941], pp. [2]+22, pls. 12, fig. 1).—Continuing these investigations (E. S. R., 85, p. 464), the author brings up to date the reports on the crossing of domestic cattle with Brahman (Zebu) cattle in five experimental herds in Australia. Among 235 head ranging from 25 to 50 percent Brahman, 88 percent of the carcasses graded as first quality. "Efforts further to stabilize the hybrid as a fixed type can proceed according to well-chosen plans, secure in the knowledge that there is nothing to lose and possibly much to gain from the process of Zebu hybridization."

Genetic differences in the social behavior of inbred strains of mice, J. P. SCOTT (*Jour. Hered.*, 33 (1942), No. 1, pp. 11-15, fig. 1).—Inbred strains of mice were found to differ substantially in the fighting behavior of adult ♂s and in other characteristics indicative of social activity.

The development of three manifestations of the short ear gene in the mouse, E. L. and M. C. GREEN. (Ohio State Univ.). (*Jour. Morphol.*, 70 (1942), No. 1, pp. 1-19, pls. 3, figs. 5).—The short-ear gene (*sc*) in mice is believed to be responsible for smaller body weight, as well as short ears and imperfect development of the xiphisternum (E. S. R., 85, p. 328). Comparative daily weights of 60 heterozygous and 44 recessive short-eared progeny from a back-cross mating showed the normal-eared ♂s to be significantly heavier at 3 days of age and the ♀s at 6 days of age than their short-eared litter mates. The differences in weight between the two types increased with age.

The origin of jerker, a new gene mutation of the house mouse, and linkage studies made with it, H. GRÜNEBERG, J. B. BURNETT, and G. D. SNELL (*Natl. Acad. Sci. Proc.*, 27 (1941), No. 12, pp. 562-565).—A new mutation in the mouse designated as jerker was found to be inherited without linkage with 16 known genes in the mouse. Jerker can likely serve as the marker for another chromosome.

The inheritance of "white-belly" in the house mouse, N. KALISS (*Jour. Hered.*, 33 (1942), No. 1, pp. 21-23, fig. 1).—The character of 116 progeny of crosses of white-, gray-, and yellow-bellied mice clearly supports the hypothesis that the white belly-yellow belly locus is not in the agouti series. Thus the white belly mutation offers a useful addition to the group of genes for regional differentiation of pigment formation between back and belly.

A study of the cytoplasmic inclusions during maturation, fertilization, and the first cleavage division of the egg of the mouse, R. A. R. GRESSON (*Quart. Jour. Micros. Sci. [London]*, n. ser., 83 (1941), No. 329, pp. 35-39, pls. 2, figs. 3).—A cytological study of oogenesis and fertilization of the mouse from 5 to 43 hr. after copulation showed that ovulation and fertilization may take place at the first or second maturation division. The sperm usually enters the egg during the second maturation division, which takes place at from 5 to 7 hr. after mating, with the first cleavage division occurring at from 21 to 28

hr. Mitochondria of sections of the sperm are transmitted to the first two blastomeres and then with the fragmented Golgi apparatus were scattered singly through the cytoplasm.

[Genetics of the fowl.—XIV], Variations in the down color of White Leghorn chicks and their economic insignificance, W. F. LAMOREUX and F. B. HUNT. ([N. Y.] Cornell Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 4, pp. 193–205, figs. 2, pl. 1).—In continuing this series on genetics of the fowl (E. R. S., 85, p. 748), strains of White Leghorn fowls which showed large percentages of dark and light down colors, respectively, were reciprocally crossed and backcrossed. Among the F_1 progeny from dark dams there was a higher proportion of dark chicks (63.6 percent) than in F_1 chicks from light dams (24.6 percent). However, sex-linked genes were not primarily responsible but some maternal influence was exerted on the down color of both sexes. The proportion of dark chicks among males was significantly higher than among females. Color of the down was shown to be quite unrelated to size at hatching, early growth, age at sexual maturity, viability, and ability to lay eggs. The darker chicks were consistently heavier in weight at first egg but the association was not clearly significant. Dark spots in the occipital region were found in 99 percent of the chicks in the dark strain, but in 36 percent of those in the light strain. Differences in the down color found in extracts were not due to the presence or absence of riboflavin, although the strains were originally developed because of differences in the riboflavin requirements.

Genic effects on serum proteins, R. W. CUMLEY, M. R. IRWIN, and L. J. COLE. (Univ. Wis.). (*Natl. Acad. Sci. Proc.*, 27 (1941), No. 12, pp. 565–570).—According to methods previously described (E. S. R., 86, p. 614), it was found that the serum of the Pearlneck could be differentiated from that of the Senegal by first absorbing certain anti-Pearlneck serums with Senegal serum and then testing with the serums of both breeds. There were no reactions to Senegal serum at dilutions of from 1:2 to 1:16, whereas Pearlneck serum reacted strongly up to 1:32 and 1:64 dilutions. This showed that the antiserum for Pearlneck contains two or more qualitatively distinct antibodies, of which one was species specific for Pearlneck and another was common to both species. The serum of backcross individuals ($\frac{1}{4}$ Pearlneck and $\frac{3}{4}$ Senegal and $\frac{1}{8}$ Pearlneck and $\frac{7}{8}$ Senegal) were tested against three types of serum and red cells. It was found that six individuals of the first backcross generation all possessed Pearlneck-specific antigens in their serums, and all but one had characters specific to Pearlneck in their red blood cells. Different genes were involved in the production of species-specific antigens in the serum and blood cells, respectively. The differences in the response of individuals in the second backcross generation to the cellular and the serum antigens specific to the Pearlneck confirmed the conclusion that the different genes for the cellular and the serum antigens were on separate chromosomes or were loosely linked.

Henny-feathering in Brown Leghorn males, A. W. GREENWOOD and J. S. S. BLYTH (*Jour. Endocrinol.*, 2 (1941), No. 3–4, pp. 343–351).—It was found that the ♀ type of plumage could be induced in a Brown Leghorn cock and related ♂s of an inbred strain by feeding thyroid powder. Barbule extension was rapid, but increased melanin deposition was slow to appear.

The physiology of domestic animals, H. H. DUKES (*Ithaca, N. Y.: Comstock Pub. Co.*, 1942, 5. ed. rev., pp. XIV+721, figs. 168).—This is another edition of the book previously noted (E. S. R., 79, p. 230), with reference in the revision to its application. The material on the endocrine organs has been revised and merged with that on reproduction, by S. A. Asdell.

The prenatal growth of the cat.—**XI, The weight of the integument in the fetus and in the adult cat.** H. B. LATIMER (*Growth*, 5 (1941), No. 3, pp. 285–292, fig. 1).—Continuing this series (E. S. R., 85, p. 466), the author shows that the weight of the skin could be predicted from body weight or length of fetal, newborn, and adult ♂ and ♀ cats.

Bone growth in the long-term castrate albino rat. G. R. POMERAT and R. C. COE (*Endocrinology*, 29 (1941), No. 6, pp. 1015–1016).—The mean lengths of the long bones of castrated rats were always less than those of controls at 1 yr. of age.

The cytology of the anterior pituitary of the fowl. F. PAYNE (*Biol. Bul.*, 82 (1942), No. 1, pp. 79–111, pls. 4).—Cytological study of over 800 pituitaries of normal and castrated fowls, on normal and deficient diets, and with and without male and female hormone treatments, showed that limited diets and unfavorable conditions retarded development of the basophiles but did not inhibit growth of acidophiles. Castration effects characterized by unusual growth of the basophiles and regression of acidophiles were largely prevented by oestrogen and androgen injections, and in normal birds these substances retarded development of the basophiles but had little effect on acidophiles. In chicks on limited diets, oestrogen injections seemed to block basophilic development completely. The enlargement of the intestines and liver with limited diets and oestrone injection suggested the secretion by acidophiles of prolactin or a growth-promoting substance. The basophiles were reduced in size and the nuclei were pycnotic in Barred Plymouth Rock hens during brooding. Aging effects in White Leghorn hens began at 2–3 yr. of age, and by 13 yr. the pituitaries were probably not functional. In the male Rhode Island Red at 9 yr. of age the pituitary was not functional and sperm formation had ceased. Functional basophiles were present at 10 days of age in White Leghorns of both sexes, but they did not function until 20 days of age in Barred Plymouth Rocks and Rhode Island Reds.

The physiology of yolk formation, especially the vitelline membrane and the mechanism of ovulation in the fowl. E. H. McNALLY (*Id. Univ. Off. Pub.*, 37 (1940), No. 9, pp. 41–42).—In this study consideration of three points needing further clarification in the physiology of egg formation showed an association of the length of the final growth phase of the ovum with increased clutch length, the formation of vitelline membrane from the collagenous membrane lining the follicular epithelium, and the effects of feeding activity and light on ovulation and laying.

Comparative activity of the gonadotrophin in horse pituitary glands and in pregnant mares' serum. I. W. ROWLANDS and P. C. WILLIAMS (*Jour. Endocrinol.*, 2 (1941), No. 3–4, pp. 380–394, figs. 2).—Comparisons of the gonadotropic effects on normal and hypophysectomized rats and rabbits of extracts of pregnant mare serum and horse pituitary gland administered in different ways were taken to indicate differences in the relative amounts of follicle-stimulating and luteinizing hormones present. In hypophysectomized rats the ovarian weights from horse pituitary stimulation were greater than from pregnant mare serum extracts, but the latter gave twice as much response in ovarian weights of intact rats. These and other findings suggested that the proportion of luteinizing hormone in pregnant mare serum was considerably less than in horse pituitary extract.

A biological assay of stilbestrol. V. L. KOENIG and R. G. GUSTAVSON (*Jour. Colo.-Wyo. Acad. Sci.*, 3 (1941), No. 1, pp. 17–18).—It was found that the amounts of oestrogen necessary to produce oestrus in 50 percent of the castrate rats were, with single injections in oil, 3.0γ of oestrone and 0.95γ of stilboestrol;

and on multiple injections in aqueous solutions, 0.92 γ of oestrone and 0.62 γ of stilboestrol.

Abnormal sex anatomy of a goat, H. T. HILL (*Endocrinology*, 29 (1941), No. 6, pp. 1003-1007, figs. 8).—The anatomy is described of a goat which outwardly appeared to be a normal ♀ but which did not attract the herd buck at 5 mo. of age. A gonad was found to be testicular on microscopic examination. The animal was probably a freemartin.

Effects of hysterectomy and of estrogen treatment on volume changes in the corpora lutea of pregnant rabbits, R. O. GREIF (*Anat. Rec.*, 80 (1941), No. 4, pp. 465-477, pl. 1).—Hysterectomy of rabbits after the first half of gestation caused rapid regression and disappearance of the corpora lutea. Removal of the uterus early in the gestation period essentially converted the pregnancy into pseudopregnancy, and the corpora lutea took the expected form. When oestrogen was administered daily, the size of the corpora lutea was maintained even after removal of the uterus and pituitary in the late stages of gestation. Extracts of placenta were unable to maintain the corpora lutea of pregnant rabbits hysterectomized on the fifteenth day of pregnancy.

The assay of oestrone in the guinea-pig, G. H. BELL and J. A. C. KNOX (*Jour. Endocrinol.*, 2 (1941), No. 3-4, pp. 399-402, fig. 1).—Full vaginal cornification was produced in 50 percent of the ovariectomized guinea pigs by 5 mg. of oestrone injected four times in 36 hr. Considering weight, this was many times the dose required by rats and mice.

Absorption of estradiol and its esters from subcutaneously implanted tablets in the guinea pig, A. LIPSCHÜTZ and L. VARGAS, JR. (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 2, pp. 464-467, fig. 1).—The average rate of absorption of 17-caprylate tablets of oestradiol subcutaneously implanted in guinea pigs was three times less than that from tablets of free oestradiol. The combination of oestradiol with two molecules of propionic acid so greatly enhanced the absorption that the number of molecules of oestradiol available from 1 mm.² of a dipropionate tablet was similar to that available from the same area of a tablet of the free hormone. These results were similar to those obtained with rats by C. W. Emmens.²

Diestrus and corpus luteum formation in persistent estrous rats by luteinizing hormone and antigonadotropic serum, H. N. MARTIN and R. K. MEYER. (Univ. Wis.). (*Endocrinology*, 29 (1941), No. 6, pp. 965-968).—Treatment of seven rats having prolonged oestrus periods with the equivalent of 500 mg. of luteinizing hormone caused dioestrus lasting from 3 to 12 days. Injection of eight rats in prolonged oestrus with from 1 to 2 cc. of antigonadotropic horse serum per day caused atrophy of the follicles and corpus luteum formation, but vaginal cornification appeared within 5 days after the cessation of the treatment. Factors concerned in continuous oestrus are discussed.

The effect of testosterone on the responsiveness of the immature gonad to chorionic gonadotropin, H. SELYE (*Jour. Endocrinol.*, 2 (1941), No. 3-4, pp. 352-356, pl. 1).—Injection of immature ♀ rats with 1 mg. daily of testosterone propionate in peanut oil caused a reduction in the average ovarian weight from 15 to 6 mg. 14 days later. The ovaries of testosterone-treated animals responded to chorionic gonadotropin but were not as responsive as normals. In repeating the experiment with ♂s it was found that the testis weight decreased from the normal of 892 to 348 mg., but spermatogenesis was not completely inhibited. These results were interpreted as indicating that the action of the gonadotropins is brought about by the action of another gonadotropic principle, presumably produced by the pituitary.

² *Endocrinol.*, 28 (1941), No. 4, pp. 633-642, figs. 4.

The influence of the placenta on the corpus luteum of pregnancy in the mouse. R. DEANESLY and W. H. NEWTON (*Jour. Endocrinol.*, 2 (1941), No. 3-4, pp. 317-321, pl. 1).—Elimination of the placentae of pregnant mice on the twelfth day of pregnancy caused the corpora lutea present to degenerate, whether or not the pituitary was present. It was also found that the corpora lutea of pregnant mice showed no reduction in size on the eighteenth or nineteenth day of gestation when the pituitary or fetuses were destroyed on the twelfth day, provided the placenta remained intact.

The production of decreased growth-rate and of organ hypertrophy in the young white rat by the thyrotrophic hormone of the anterior pituitary. A. T. CAMERON and J. CARMICHAEL (*Roy. Soc. Canada, Trans.*, 3. ser., 35 (1941), Sect. V, pp. 25-29).—In three experiments injections of thyroid reduced the growth rate and caused a definite hypertrophy of the liver, heart, and kidneys of rats during the 6-day test. The increment was reduced by feeding thyrotrophic hormone from the pituitary. Somewhat less effects were produced in 10-day treatments. The effects of thyroid injections were fairly rapidly corrected once the thyroid feeding was stopped.

FIELD CROPS

[Research with field crops in Illinois] (*Ill. State Acad. Sci. Trans.*, 34 (1941), No. 2, pp. 46-50, 51-60, 73-76, 84-85, fig. 1).—Articles of interest to agronomists, reporting on current research, included Relation Between Moisture Content of the Soil and the Optimum Depth of Planting Corn, by G. H. Dungan and W. C. Brokaw (pp. 46-47) (Univ. Ill. et al.); Preliminary Report on Corn and Pasture Fertilization in Southern Illinois, by R. C. Cassell (pp. 48-50); Palatability of Pasture Plants, by R. F. Fuelleman and W. L. Burlison (pp. 51-55); The Role of Hybridization in the Improvement of the Soybean, by C. M. Woodworth (pp. 57-60), and Trace Elements in Oats and Sudan Grass, by G. R. Noggle (pp. 84-85) (all Univ. Ill.); Certain Factors Affecting the Growth of *Azotobacter* in the Soil, by J. L. Sullivan (pp. 55-57); Germination and Seedling Growth-Form of Two Hundred Weeds, by A. P. Kummer (pp. 73-74); and Relation of the Effects of Seed Weight to Roots and Tops of Two Varieties of Soybeans, by S. W. Oexemann (pp. 75-76).

[Farm crops research in Mississippi] (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 2, pp. 1, 3, 8).—Results from current agronomic research are reported in articles entitled Cottonseed Meal More Valuable for Feed Than as Source of Nitrogen, by R. Coleman (pp. 1, 3); Summer Legumes Aid Corn, Cotton, in Stoneville Test, and High Returns From Nitrogen for Corn on Soils of Delta (both p. 8), both by R. Kuykendall; and More Nitrogen Recommended in Cotton Fertilizer, Whether Applied Before Planting or Used as Side-Dressing, by W. B. Andrews (p. 8).

[Field crops experiments in Missouri]. (Partly coop. U. S. D. A.). (*Missouri Sta. Bul.* 438 (1941), pp. 20, 37-38, 56, 57-62, 64-65, 68).—Work with field crops (E. S. R., 83, p. 185) reported on briefly by M. M. Jones, R. P. Beasley, L. Hightower, A. C. Ragsdale, C. W. McIntyre, C. A. Helm, B. M. King, W. C. Etheridge, E. M. Brown, J. M. Poehlman, L. J. Stadler, G. F. Sprague, J. G. O'Mara, E. R. Sears, L. Smith, and R. A. Schroeder included breeding work with corn, wheat, oats for immunity or resistance to smuts, barley, and soybeans; selection among selfed corn lines and convergent improvement; genetic studies with corn, especially on the production of genetic variations by radiation of pollen with ultraviolet and X-rays; polyploidy studies with wheat; variety trials with corn (and hybrids), wheat, barley, soybeans, oats, and cotton; yields and

production costs of alfalfa, bluegrass pasture, and rye, barley, and corn silage on the Hatch farm; green-sprouting treatment of potatoes; fertilizer tests with corn (placement) and potatoes; effects of variety, soil type, fertilizer treatment, and season on the chemical composition of soybean seed; and pasture research, including response of Kentucky and Canada bluegrasses, orchard grass, and Bermuda grass in growth of roots, rhizomes, and herbage to soil and air temperature variations; influence of continuous, rotation, and supplemented (Korean lespedeza) grazing on the live-weight gains made on bluegrass pasture by beef cattle; and a comparison of rotation pastures with cultivated crops in the production of feed for cattle.

[**Field crops and plant improvement research in New York.**] (Partly coop. U. S. D. A.). ([*New York*] *Cornell Sta. Rpt. 1941*, pp. 92-93, 94-95, 96-97, 117, 140, 143-144, 144-145, 145-146, 173-174, 174-175, 176, 179-181).—Progress results are reported by D. B. Johnstone-Wallace, J. A. Blizzell, H. B. Hartwig, R. Bradfield, L. F. Randolph, J. F. Cornman, H. H. Love, F. P. Bissell, W. T. Craig, N. F. Jensen, R. G. Wiggans, J. R. Livermore, P. H. Wessels, H. C. Thompson, R. H. White-Stevens, P. Work, E. V. Hardenburg, O. Smith, G. E. Davis, F. McGoldrick, and L. B. Nash from breeding work with corn, wheat, oats, barley, soybeans, and potatoes; studies on the number, form, and behavior of the chromosomes in corn and other plants, with special reference to their role in heredity; cultural, fertilizer, seed production, and strain tests with birdsfoot trefoil, and its merits for hay and pasture compared with other forage legumes; pasture and hay seeding mixtures and seeding technics; studies of methods of hay production and preservation, including millet strain and variety study, alfalfa management studies, and emergency hay crop comparison; N fertilization for timothy; adaptation of foreign and domestic varieties and strains of red and alsike clovers in New York; a study of grasses, grass associations, and legumes for pasture purposes; a study of complete fertilizer formulas for use on established turf and the relative value of organic and inorganic N sources; and potato investigations, including variety, fertilizer, green manures and cover crops, rotation, and soil reaction experiments, and studies of the handling and storage of seed potatoes and of the factors affecting chemical composition and culinary quality of tubers.

Illinois corn performance tests, 1941, R. R. COPPER, G. H. DUNGAN, A. L. LANG, J. H. BIGGER, B. KOEHLER, and O. BOLIN. (Coop. U. S. D. A. and Ill. Nat. Hist. Survey). (*Illinois Sta. Bul. 482* (1942), pp. 473-528, figs. 4).—Corn yields on the 12 fields in the 1941 tests (E. S. R., 85, p. 44), including 348 hybrids and 14 open-pollinated varieties, averaged 82.9 bu. per acre, the highest average ever recorded for the tests and 30.4 bu. above the estimated State average. During the 8 yr. (1934-41) of these tests, average yields on the test fields exceeded the average State yields by 111, 94, 79, 64, 47, 53, 64, and 58 percent, respectively. The 5 best hybrids on all 12 fields averaged 18.6 bu. of sound corn per acre above the open-pollinated varieties and 16.5 bu. more than the 5 poorest hybrids. Each year higher-yielding hybrids have been entered than were entered the year before. The progressive improvement of hybrids was further shown in the amount by which hybrids have exceeded open-pollinated varieties in average total yields.

The susceptibility of many hybrids to the southern corn rootworm was responsible for much of the farmers' difficulty in harvesting the 1941 crop. Differences in resistance or susceptibility of commercial hybrids were recorded on 5 fields. Some hybrids consistently gave good accounts of themselves. Corn ear rots caused more damage in Illinois in 1941 than in any year since 1934, and wide differences in amount of kernel damage occurred in different hybrids. Diplodia stalk rot caused premature dying and breaking down of stalks in a consid-

erable area of the State for the third time in the last 5 yr. On only 2 of the 12 fields was there an appreciable number of dropped ears.

In the soil-adaptation test at Urbana favorable weather resulted in extraordinarily high yields, favoring especially hybrids adapted to good soil. The five top-ranking hybrids on the high soil were 701, 1517, 1450, 1517, and 1517, 1517 as common parents. Hy and 701 are adapted to the high soil, while 1517 is adapted to the less productive soil.

Diameter of fiber in different strains of Acala cotton, G. N. STROMAN. (N. Mex. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 64 (1942), No. 4, pp. 243-255, figs. 4*).—Data obtained on 6 strains of Acala cotton to determine the swollen diameter of fiber in each of 11 group lengths of from $1\frac{3}{8}$ to $\frac{1}{8}$ in., inclusive, showed that the shorter lengths had the largest diameters. Measurements of swollen diameter on the $1\frac{1}{8}$ -in. length made on 12 strains from the advanced test in 1938 and 16 strains in 1940 at the station revealed significant differences between strains. In 1938 the strain 128-5 had the largest mean fiber diameter of 23.3μ , and strain 1450 had the smallest mean fiber diameter, 20.9μ . Of all the Acala strains tested in 1940, No. 1517 had the largest mean fiber diameter, 23.57μ , and strain 2815 the smallest mean fiber diameter, 22.10μ . The significant differences between these two mean diameters in 1938 and 1940 indicated that the cotton breeder could breed strains of cotton with small diameters.

A significant difference was found among strains in ribbon width and thickness and significant positive correlation coefficients between ribbon width and thickness in two of four strains tested. Significant negative coefficients were obtained between ribbon width and number of convolutions in three of four strains, while a significant negative correlation between ribbon thickness and number of convolutions was found in only one of four strains.

The relative respiratory rates and hygroscopic equilibria of common and hull-less oats, P. E. RAMSTAD and W. F. GEDDES. (Minn. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 64 (1942), No. 4, pp. 237-241*).—The respiratory rate per unit of dry matter of Gopher common oats with test weight of 32 lb. per bushel was appreciably higher than that of Nakota hull-less, 47 lb. per bushel, even under conditions which favored mold growth. Gopher oats in equilibrium with atmospheres of different relative humidity was less hygroscopic (about 0.7 percent) than Nakota oats. The difference was shown due to the low hygroscopicity of oat hulls, which comprise about 25 percent of the kernel; at 70-percent humidity oat groats contained 13.8 percent of moisture and oat hulls 12 percent. The higher respiratory rate of Gopher oats as compared with Nakota at the same total moisture content is due in part to the low hygroscopicity of the hull and consequent higher moisture content of the respiring material, as shown by the fact that oat groats had a lower respiratory rate than commercial oats from which they were prepared. At corresponding relative humidities, calculations indicate that Gopher oats have only a slightly higher respiratory rate than Nakota.

As far as danger from heating is concerned, hull-less oats evidently could be stored safely at fully as high a moisture content as ordinary oats, but definite conclusions necessitate more thorough investigation of their susceptibility to micro-organisms. In storing oats for seed purposes, the current practice of preservation in bags stacked to permit free access of air should be continued until comparative data are available for relative changes in germination capacity of oats stored in bags and bins over a period of time.

Growing good crops of oats in Missouri, J. M. POEHLMAN (*Missouri Sta. Bul. 439 (1942), pp. 12, figs. 2*).—A revision of Bulletin 402 (E. S. R., 80, p. 615).

Varieties of oats for North Dakota, T. E. STOA and C. M. SWALLERS. (Partly coop. U. S. D. A.). (*North Dakota Sta. Bimo. Bul.*, 4 (1942), No. 3, pp. 24-30, fig. 1).—Data on behavior of oats varieties in North Dakota, accumulated since the previous report in 1936 (E. S. R., 76, p. 100), summarized, with remarks on the characteristics and adaptation of leading and new varieties. Varietal leaders include Gopher and Iogold, early; Rainbow and Marston, mid-early, and Rusota, Anthony, and Victory, mid-late. The experimental results have borne out farm experiences and farmer preferences. Early or mid-early varieties are now grown most extensively in the southeastern part of the State, throughout the Red River Valley, and the east-central part. They are also preferred elsewhere on the heavier soils and where earliness is particularly desired, because they aid in weed control and escape late drought or insect damage. In the more northern and north-central sections, later midseason varieties predominate.

The effect of lightweight and heavyweight seed wheat upon the yield of the resulting crop, L. R. WALDRON (*North Dakota Sta. Bimo. Bul.*, 4 (1942), No. 3, pp. 15-18).—A popular account of experiments reported earlier (E. S. R., 85, p. 760).

Spring wheat: Adaptability for Illinois, G. H. DUNGAN and W. L. BURLISON (*Illinois Sta. Bul.* 483 (1942), pp. 529-540, figs. 2).—Cultural practices and varieties of spring wheat are recommended from results on experiment fields, 1927-41. Respective average acre yields of spring and winter wheat were in northern Illinois (DeKalb and Mt. Morris) 18.4 and 28.1 bu., central Illinois (Urbana) 25.1 and 33.4, and southern Illinois (Alhambra) 7.4 and 25.6 bu.

Spring wheat in a rotation usually follows corn, soybeans, or winter wheat winter-killed or drowned out. After corn the land should be plowed by late fall or early winter and all stalks covered. Double-disking and harrowing just before drilling suffices for a seedbed on plowed cornstalk land, soybean stubble, or on land where winter cereals have failed. Other production practices include choice of the Sturgeon, Progress, and Illinois 1, seed treatment to control seedling blight and covered smut, planting as early as weather and soil conditions will permit, drilling from 6 to 8 pk. to the acre or broadcasting from 9 to 10 pk. an acre, and harvesting when fully mature. Spring wheat should not be grown in areas where chinch bugs are abundant and not sown next to fields of winter wheat badly infested with hessian fly.

North Dakota wheat breeders in action, H. L. WALSTER (*North Dakota Sta. Bimo. Bul.*, 4 (1942), No. 3, pp. 2-6).—Current activities of the station agronomists and cooperating agronomists of the U. S. D. A. Bureau of Plant Industry are reviewed.

Which variety of wheat should one grow in 1942? T. E. STOA, L. R. WALDRON, R. H. HARRIS, and L. D. SIBBITT (*North Dakota Sta. Bimo. Bul.*, 4 (1942), No. 3, pp. 6-13, figs. 3).—A brief discussion of merits and known limitations of the varieties generally available, covering Thatcher, Nordhousen, Rival, Pilot, Regent, Renown, and several other hard red spring varieties, and the durum Mindum, Kubanka, Monad (D-1), Red Durum (D-5), and Golden Ball. The comparable yield data obtained in variety trials conducted in 1941 are tabulated, together with average yields for the years under test.

Results of seed tests for 1941, B. G. SANBORN (*New Hampshire Sta. Bul.* 334 (1941), pp. [1]+14).—Purity and germination percentages are tabulated for 416 official samples of field and forage crop seed collected from dealers in New Hampshire during the year ended June 30, 1941.

The viability and germination of seeds of *Convolvulus arvensis* L. and other perennial weeds, E. O. BROWN and R. H. PORTER. (Coop. U. S. D. A.).

(*Iowa Sta. Res. Bul.* 294 (1942), pp. 473-504, figs. 4).—Field and laboratory studies were made, 1935-39, of the production, viability, impermeability, longevity, and germination of seeds of bindweed (*C. arvensis*) and of other deep-rooted perennial weeds.

Bindweed plants produced an abundance of seed in seasons of high temperature and low rainfall, whereas cloudy periods restricted blossoming and seed production. Just after collection on the plants, production of normal seedlings by seeds varied from 7 to 24 percent, impermeability from 28 to 91, and dead seeds from 2 to 51 percent. In lots from 1 to 72 yr. old, dead seeds ranged from 2 to 100 percent. Seeds 50 yr. old from an herbarium approximated 62 percent in viability. Germinability began from 10 to 15 days after pollination when the moisture content was 81 percent, and impermeability became pronounced from 23 to 25 days after pollination when the moisture was 13 percent. Impermeability developed from 1 to 4 days sooner in immature seeds collected and stored at high temperatures than in seed ripening naturally on the plants.

Immersion of impermeable bindweed seeds in concentrated H_2SO_4 from 45 to 60 min. resulted in rapid germination under favorable conditions. Concentrations of 50 and 25 percent for 2 and 9 mo., respectively, gave results equal to the concentrated acid for 60 min. Moist air, water, and soil at high and low temperatures also reduced markedly seed impermeability. A maximum of 48 percent of impermeable seeds germinated the next spring after being covered with a 3-in. layer of soil in winter, and impermeable seeds retained a considerable degree of viability and impermeability for 4 yr. after burial in soil at 6 and 18 in. Seeds planted every 2 weeks from April 25 to September 26, 1930, germinated and produced plants at each planting. Maximum root penetration in the soil approximated 68 in.

The respective temperatures determined for germination of the seeds were for bindweed minimum 0.5°, maximum 40°, and optimum 30°, 20°-30° and 20°-35° C.; leafy spurge (*Euphorbia esula*) minimum 0.5°, maximum 40°, and optimum 20°-30° and 20°-35°; pepper cress (*Lepidium draba*) minimum 0.5°, maximum 40°, and optimum 20°, 20°-30° and 20°-35°; Russian knapweed (*Centaurea repens*) minimum 0.5°, maximum 35°, and optimum 20°-30° and 20°-35°; and horsetettle (*Solanum carolinense*) minimum 20.0°, maximum 40°, and optimum 20°-30° and 20°-35°.

Concentrations of oxygen below 21 percent were unfavorable for the germination of seeds of *S. carolinense* and below 10 percent were unfavorable to seeds of *L. draba*, bindweed, and *E. esula*. Concentrations as high as 53 percent O_2 were favorable for germination of seeds of all of the four species except *E. esula*, which did not germinate well above 21 percent O_2 .

Viability of seeds of *L. draba*, *L. repens*, and *Hymenophyllum pubescens* declined rapidly when they were buried from 4 to 6 in. deep in soil for 3 yr. Seeds of *E. esula* retained vitality well for 3 yr. at 6- and 18-in. depths. Seeds of *Centaurea calcitrapa* and *C. solstitialis*, in general, were short-lived when buried in the soil, declining from 90 to 10 percent or less in 3 yr., whereas seeds of *C. repens* usually retained vitality well. Dormancy either when the seed-burial test was started or afterward was prominent in seeds of *S. elaeagnifolium* and *S. carolinense* but had disappeared after 3 yr. of burial, and vitality was greatly reduced at the lower depth of 18 in. in seeds of *S. elaeagnifolium*. Seed of *S. carolinense* germinated 98 percent after 3 yr. when buried at from 4 to 6 in., but practically all were nonviable at from 10 to 18 in. *S. carolinense* seeds overwintering in immature berries on the soil surface were nonviable the next spring. Mature seeds were partially dormant, a condition persisting for 17 mo. in dry storage.

Bindweed control by sodium arsenate, borax, and sodium chlorate, E. A. HELGESON (*North Dakota Sta. Bimo. Bul.*, 4 (1942), No. 3, pp. 14-15).—The chemicals were applied dry, separate and in mixtures, to a uniform stand of bindweed on November 7, 1940, and surviving plants were counted July 25, 1941. Sodium chlorate was most effective, and control by mixtures was largely due to the chlorate included. Mixture of sodium arsenate and sodium chlorate was not particularly effective, nor was any additive effect apparent. Borax alone did not give entirely satisfactory results.

Weeds of California, W. W. ROBBINS, M. K. BELLUE, and W. S. BAIL. (*Sacramento: State Dept. Agr.*, 1941, pp. [1]+491, [pls. 24], figs. [320]).—This practical manual treats of principles of weed control, control of perennial weeds, and chemical control methods; provides keys to families and to species with woody stems; and describes the native and exotic weed species occurring in California. Lists show weeds most commonly found in small grains, rice, range lands, pastures and meadows, lawns and golf courses, alfalfa, vineyards and orchards, and alkaline and maritime soils; important stock-poisoning plants; and poisonous weeds of minor or local importance. A comprehensive index is appended.

HORTICULTURE

[**Horticultural studies by the Missouri Station**] (*Missouri Sta. Bul.* 438 (1941), pp. 66, 67-68, 70).—Brief reports are presented on the following studies: Fertilization of apple trees and control of biennial bearing of apples, both by A. E. Murneek; grape nutrition, by H. G. Swartwout; variety tests of cabbage for disease resistance and fertilizer requirements, variety tests of watermelons, effect of root temperatures on the growth of cucumbers, effect of growth-promoting substances on the set of tomato plants, and tomato variety tests, all by R. A. Schroeder; relation of age to performance of apple branches, by Murneek and D. G. White; and branch ringing as a means of affecting fruit set in apples, by Murneek.

Simultaneous measurement of carbon dioxide and organic volatiles in the internal atmosphere of fruits and vegetables, F. GERHARDT. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 4, pp. 207-219, figs. 3).—"A method and an apparatus have been described for the simultaneous measurement of CO₂ and total volatiles in the internal atmosphere of fruits and vegetables. These analyses can be made simultaneously from the same sample of plant tissue.

"The method involves (1) extraction of the internal atmospheres by refluxing and aspirating the plant tissue in boiling distilled water for 2 hr. in an air stream of CO₂-free air at 20 l. per hour; (2) absorption of the components of the internal atmosphere in two gas scrubbers in series, the first bearing activated sulfuric acid for the removal of organic volatiles and the second bearing standard alkali for the removal of CO₂; and (3) the oxidation of the organic absorbates with ceric sulfate.

"Applications of the method include studies of (1) the adsorptive capacity of oiled fruit wraps for volatile emanations; (2) the influence of storage temperature, ripening processes, and soft scald on the composition of the internal atmosphere of fruits; and (3) comparative analyses of the internal atmosphere of certain vegetables and deciduous fruits."

[**Vegetable crop studies by the Cornell Station**] ([*New York*] *Cornell Sta. Rpt.* 1941, pp. 144, 145, 146, 173-174, 175, 176, 177-179, 181-182).—Included are reports of studies on breeding cabbage by C. H. Myers, celery by R. A. Emerson, H. C. Thompson, and A. G. Newhall; cucumbers for disease resistance by Myers, O. Shifriss, and C. Chupp, and muskmelons by Emerson and H. M.

Munger; fertilizer requirements of vegetables on Long Island, by P. H. Wessels, Thompson, and R. H. White-Stevens; varieties and strains of vegetables, by P. Work and E. V. Hardenburg; crop adaptation and soil management of vegetables on muck soils, by G. J. Raleigh and R. D. Sweet; land utilization for vegetable crops, by Thompson, Raleigh, O. A. Lorenz, and G. F. Warren, Jr.; lettuce improvement, by Raleigh, E. M. Andersen, and J. F. Harrington; wax emulsions for retarding deterioration of fresh vegetables and for reducing water losses from vegetable plants, by H. Platenius and L. L. Morris; and vitamins and growth-regulating substances in vegetable production, by Thompson, O. Smith, and E. C. Minnum.

Victory gardens, V. R. BOSWELL (*U. S. Dept. Agr., Misc. Pub. 483* (1942), pp. 11+11).—This publication includes general information on the value of vegetables in the diet and instructions as to what species to grow, how to plan the garden and prepare the soil, the use of fertilizers and planting methods, and how to utilize the crop.

Gardens for food, health, and victory, L. R. FARISH and R. O. MONOSMITH (*Miss. Farm Res. [Mississippi Sta.], 5* (1942), No. 2, pp. 1, 6, fig. 1).—General information is presented on soil preparation, fertilization, methods of planting, cultivation, pest control, storage of vegetables, etc.

Performance trials of new "baby" bush lima beans grown for canning.—A progress report, C. H. MAHONEY, H. A. HUNTER, and A. WHITE (Univ. Md.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 541-545).—In this 1-yr. study of the influence of date of planting and rate of seeding on the yield of certain new varieties of lima beans, evidence was obtained that the time of planting, rate of seeding, and possibly the interaction between the two may influence the yields of the newer varieties as compared with Henderson. The yield of Henderson was apparently not influenced greatly by the stand of plants, at least within the range of 5.5 to 11.5 plants per yard. Early Baby Potato Lima appeared to require fewer plants per yard as a stand of five plants gave the highest yields. Maryland Thick Seeded, a small variety, produced its greatest yields with nine plants per yard. Later plantings were more favorable for the newer varieties, but because of occasional early frosts it is conceded likely that Baby Potato and Baby Fordhook should not be planted much later than June 20.

The relation of spacing to yield and to plant and ear development of some yellow sweet corn hybrids in New York, W. D. ENZIE (*New York State Sta. Bul. 700* (1942), pp. 19, figs. 3).—Records taken over a 4-yr. period on Seneca Golden hybrid sweet corn showed the highest average yield when plants were 9 in. apart in 30-in. rows. Three years' data on Tendergold corn revealed the highest average yields when planted in 30- or 36-in. rows with plants 12 in. apart. Three years' records on Golden Cross showed the highest mean yield when planted in 36-in. rows with plants 12 in. apart. Spacing was found to have a significant effect on maturity with all three kinds maturing most rapidly when grown with abundant space, either 36-in. check rows or 36-in. drill rows with plants 12 in. apart. There was no significant difference in plant height as a result of spacing treatment. In general, the wider the spacing the greater was the number of tillers and the greater the number of second ears produced. Length of ear was increased significantly in all three varieties by wider spacing, but there was no significant difference between the 36-in. check row and the 36-in. drill row with plants 12 in. apart.

The effect of plant spacing on yield, ear size, and other characters in sweet corn, R. M. BAILEY (Maine Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 546-553, figs. 5).—Evidence was obtained that the optimum spacing varies with the variety of sweet corn and that early-maturing, less vegetative

kinds require less area than more vegetative varieties. As the plant feeding area was increased, there was a marked tendency for the plant to produce more, heavier, and longer ears. Too close spacing resulted in many barren plants, while extreme spacing resulted in the development of small secondary ears which reduced the average ear weight and length and percentage of usable ears. Six to 12 in. between plants in the drilled row, depending somewhat on the variety, is suggested for most Maine conditions.

Measurement of solids in melon juice, H. W. ALLINGER, C. S. BISSON, E. B. ROESSLER, and J. H. MACGILLIVRAY. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 563-566, figs. 2).—A high degree of correlation was found between the results attained by three methods, (1) field refractometer, (2) Abbé refractometer, and (3) the evaporation technic. The highest value for soluble solids was obtained by converting the Abbé reading to sucrose by means of the Schonrock table. The evaporation method gave the lowest reading, and the field refractometer was intermediate. The three methods tended to check more closely for watermelons than for cantaloups. Neither sugar solutions nor potassium salts, alone or combined, were sufficiently different to account for the differences obtained by the three methods.

Preliminary studies on a new muskmelon hybrid, J. C. HOFFMAN and H. D. BROWN. (Ohio Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 535-536).—A hybrid obtained from a cross of a selfed seedling of the Perfecto muskmelon pollinated by Milwaukee Market is considered promising because of its very small cavity, firm texture, and good quality. The foliage displayed superior resistance to common leaf diseases when compared with 80 other lines and varieties of muskmelon.

English pea varieties, Crystal Springs, J. A. CAMPBELL. (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 2, p. 7, fig. 1).—In garden pea trials Glacier, World Record, President Wilson, and Pride were leading varieties with respect to yield in the early, second-early, midseason, and late groups, respectively.

Frost tolerance of strains of market garden peas, B. L. WADE. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 530-534, fig. 1).—Certain breeding stocks of peas and some commercial varieties reacted differently during the seedling stage to natural temperatures as low as 19° and 21° F. occurring near Charleston, S. C., during the spring and fall of 1939. Many of the differences observed were significant, and certain of the low-temperature-tolerant strains were released for wider tests. Most of the strains tested were in the fifth to eighth generation following the cross and were apparently homozygous for most characteristics. However, some of the strains which suffered heavy frost injury had a few surviving plants which appeared rather tolerant to low temperature.

The effect of methods of growing and transplanting the plants on the yield of peppers, W. H. LACHMAN, E. A. WEST, and G. B. SNYDER. (Mass. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 554-556).—Of five methods of growing pepper plants compared in 1938, production in 4-in. pots was most effective with respect to early and total yields following transplanting to the open field. In 1939 and 1940, the clay-pot method was again effective, particularly when a transplanting solution was also supplied. Careful growing of plants proved essential in promoting early yields. Paper pots and paper bands tended to reduce yields, unless some quickly available nitrogen was applied to offset the shortage of plant food. Transplanting solutions appeared to be useful in encouraging a quick replacement of roots and in stimulating early growth.

Growth of the Perfection pimlento fruit, H. L. COCHRAN. (Ga. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 557-562, figs. 2).—Measurements taken in the field and in the greenhouse indicated that the size increase of Perfection pimlento peppers divides into three stages, (1) a period of slow growth which lasts from the early bud stage until 3 or 4 days after full bloom, (2) a period of rapid growth lasting about 3 weeks, and (3) a sudden slowing down of growth with gradual decrease as maturity approaches. When growth rates were plotted graphically against time, an S-shaped curve, normal in most respects, was obtained.

Some responses of tomato fruits to methyl-bromide fumigation, J. E. KNOTT and L. L. CLAYPOOL. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 501-506, figs. 2).—An immediate speeding up of certain metabolic processes, such as an acceleration in respiration, was observed in "mature green" tomatoes treated with methyl bromide at 68° F. The effect was similar to that of ethylene as recorded on various fruits. The subsequent reduced metabolic activity in the methyl bromide treatment did not agree with ethylene effects, suggesting that several metabolic processes may be involved in the methyl bromide treatment. Possibly the activity of certain enzymes may have been affected. The respiration curve of methyl bromide-treated fruits suggests that respirable materials were used up rapidly and depleted because of the slowing up of another process, thereby causing the end result to be a reduction in the respiration rate.

Tomato trends by areas, with particular reference to Northeastern States, W. KLING (*U. S. Dept. Agr., Bur. Agr. Econ.*, 1942, F. M. 27, pp. [2]+74, figs. 19; *Sup.*, pp. [2]+16).—This mimeographed report presents information on trends in tomato production for fresh market use and for processing, with data on prices and on prospects for the near future.

Relative rind toughness among watermelon varieties, I. J. KENNY and D. R. PORTER. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 537-540, figs. 2).—Records taken with a modification of the standard fruit pressure tester indicated that this apparatus furnishes a satisfactory method for measuring rind toughness in watermelons. The layer of thick-walled parenchyma cells extending from the sclerenchyma layer down into the middle mesocarp suggests a morphological explanation of toughness in watermelon rinds.

Inspection, certification, and transportation of nursery stock in Kentucky, with a brief report for the year ended June 30, 1941, W. A. PRICE and H. G. TILSON (*Kentucky Sta. Regulat. Ser. Bul.* 29 (1941), pp. 16).—This contains administrative information relating to certification, the status of various insect and disease pests, lists of certified nurserymen, etc.

Pruning trees on home grounds, F. S. BATSON (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 2, p. 3, figs. 2).—Information is offered on the objectives and methods of pruning trees, the treatment of pruning wounds, etc.

Selecting fruit varieties, T. J. TALBERT and A. D. HIBBARD (*Missouri Sta. Bul.* 437 (1941), pp. 51).—Discussing briefly the origin of fruit varieties by chance, by mutation, and by scientific breeding, the authors point out the importance of careful selection of varieties, discuss pollination requirements, and describe outstanding varieties of apples, pears, peaches, cherries, plums, grapes, strawberries, blackberries, raspberries, currants, and other fruits. The data on varieties are summed up in tabular form by species and give information on season of ripening, use of the fruit, etc.

[Promological studies by the Cornell Station] ([*New York*] *Cornell Sta. Rpt.* 1941, pp. 157-161).—The following studies are discussed: Soil factors associated with significant differences in yield and behavior of fruit crops, by D.

Boynton, A. J. Heinicke, J. C. Cain, and O. C. Compton; daily rate of photosynthetic activity in entire fruit plants as influenced by cultural practices, and effect of types of pruning on the alternate bearing habit in biennial varieties, both by Heinicke; special practices to induce early and regular bearing in the apple and pear, by Heinicke and T. Shen; effect of manure on the yield of low-producing fruit trees, by Heinicke; nutritional conditions of fruit-tree tissues and their relation to biennial bearing and other fluctuations in yield and growth, by Heinicke and L. J. Edgerton; the abscission of immature fruits and the preharvest drop of apples as affected by culture and hormone sprays, by Heinicke and M. B. Hoffman; natural and controlled pollination in the orchard, by Hoffman, A. Van Doren, and L. F. Hough; the effect of different low but nonfreezing temperatures on the keeping quality of apples, by R. M. Smock; the comparative efficiency of oiled wraps and shredded oiled paper and different waxes in the control of apple scald and shriveling, by Smock and F. W. Southwick; the effect of careless handling on the keeping of apples, by Hoffman, Van Doren, and Smock; and the influence of blossom-spray and fruit-thinning practices on the annual bearing of apples, by Hoffman and Heinicke.

Respiration studies of developing Jonathan apples, S. T. SHAW (*Plant Physiol.*, 17 (1942), No. 1, pp. 80-90, figs. 3).—Using the Warburg technic which employed the Barcroft differential manometer, considerable variation was found in respiration rate between the different apples measured on the same day. The rate of respiration was high during the period immediately following fruit setting and then decreased gradually for the remainder of the period. When sections of fruits were used for measurement, the increased surface and the effect of the wounding increased the rate of oxygen consumption about 63 percent. The respiratory quotient decreased from 0.84 on May 23 to 0.46 on June 28, at which time it began to increase until on July 26 it was 0.92.

The respiratory metabolism of McIntosh apples during ontogeny, as determined at 22° C., G. KROKOV (*Plant Physiol.*, 16 (1941), No. 4, pp. 799-812, figs. 9).—Respiration studies with fruits taken at repeated intervals from a mature McIntosh tree growing in a commercial orchard near Kingston, Ontario, revealed from early July onward a direct proportionality between the duration of life and the total amounts of carbon dioxide produced by the apples in the climacteric period of their respiration. A complete respiration record of a fruit was found to consist of a preclimacteric and a climacteric period. It is shown that the earliest records are represented by the preclimacteric and the latest records by the climacteric periods only. Changes in a complete respiration record are believed to be based on variations in the concentration of the respiratory substrate. Fungal infection did not occur until the fruits had reached a definite physiological stage, when disintegration was already under way, hence fungal infection was a consequence, and not the cause, of death.

Common spray materials alter the internal structure of apple leaves, W. F. PICKETT and C. J. BIRKELAND. (*Kans. Expt. Sta.*). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 158-162, figs. 3).—An earlier paper (E. S. R., 77, p. 190) discussed the relation of internally exposed surfaces of apple leaves to their photosynthetic behavior. In this later study, the author concludes that part of the reduction in photosynthetic activity resulting from repeated applications of certain spray materials may be due to the changes brought about in the internal structure of the leaves.

Influence of bordeaux mixture and its component parts on transpiration and apparent photosynthesis of apple leaves, F. W. SOUTHWICK and N. F. CHILDERS. (*Ohio State Univ.*). (*Plant Physiol.*, 16 (1941), No. 4, pp. 721-754,

figs. 4).—Leaves of Stayman Winesap trees growing in tubs placed in chambers where the temperature, light, and relative humidity were under control were sprayed with bordeaux mixture and certain components thereof. Photosynthesis was reduced at least temporarily by bordeaux mixture regardless of temperature, light, relative humidity, or soil moisture conditions. Apparently the effect was physiological rather than mechanical, and the soluble copper fraction appeared to be the active agent. The temperature at which bordeaux mixture may be expected to instigate visible injury to apple leaves was between 60° and 70° F. The general effect of bordeaux mixture applied to young apple trees growing under low soil moisture conditions was a slightly reduced rate of transpiration.

Brief mention has been made of this study (E. S. R., 84, p. 210).

The "thin wood" method of pruning bearing apple trees, H. P. GASTON (*Michigan Sta. Cir. 179 (1942), pp. [1]+16, figs. 10).*—This is an abridged report of investigations previously published in more detail (E. S. R., 74, p. 642).

Peach growing in Washington, E. L. OVERHOLSER, A. L. KENWORTHY, and R. M. BULLOCK (*Washington Sta. Pop. Bul. 162 (1941), pp. 32, figs. 7).*—General information is given on production, climatic and soil requirements, nursery stock and planting, training and pruning, cultural management, irrigation, fruit thinning, harvesting and handling, canning (E. S. R., 83, p. 630), freezing preservation (p. 139), control of diseases (by J. G. Harrar and J. D. Menzies), and insect pests (E. S. R., 70, p. 358).

Effects of growth regulating chemicals on the opening of vegetative and floral buds of peach and pear, J. W. MITCHELL and F. P. CULLINAN. (U. S. D. A.). (*Plant Physiol.*, 17 (1942), No. 1, pp. 16-26, figs. 2).—Under controlled conditions in the greenhouse, detached branches of pear and peach trees were sprayed with lanolin and oil emulsions containing different amounts of indoleacetic, indolebutyric, and naphthaleneacetic acids, and naphthalene acetamide. None of the compounds hastened the opening of the flower buds of the pear. In the first of 2 yr., naphthaleneacetic acid emulsion when used at an early stage of bud development stimulated the opening of Elberta and Belle flower buds. Naphthalene acetamide had a similar effect on Belle, but not on Elberta buds. In field experiments, in no case was there evidence of retarding the time of blooming. The growth of vegetative buds was consistently retarded by applications of naphthaleneacetic acid, leading to the suggestion that the substance may prove useful in delaying the opening of leaf buds of transplanted trees. In the second season the spraying of dormant flower buds with naphthaleneacetic acid caused injury, and was ineffective when applied after the flower buds had begun to swell. It is suggested that the variable results attained may have been due to variations in food reserves and in the stage of development of the buds.

Boron deficiency in apricots, R. E. FITZPATRICK and C. G. WOODBRIDGE (*Sci. Agr.*, 22 (1941), No. 4, pp. 271-273, pl. 1).—In the spring of 1937 boric acid was supplied to a group of trees planted in 1935 in tubs of sand and given nutrient solutions. Through the years 1937-39 there was no detectable symptom of malnutrition, but there was recorded a decided drop in boron content of the fruit of the nonboron trees in the fall of 1939. In 1940 all of the nonboron trees showed marked deficiency symptoms, and certain ones died without developing leaves. Some dieback and foliage symptoms were observed in several Okanagan Valley (B. C.) apricot orchards in 1940. The twigs of the affected trees were low in boron. Spraying the injured trees with boric solution, 4 lb. to 100 gal. of water, induced recovery.

Growth and composition of the strawberry plant as affected by source of nitrogen and pH value of the nutrient medium, J. H. CLARK (*New Jersey Stas. Bul. 691 (1941), pp. 48, figs. 9*).—In the case of Howard 17 strawberry plants grown in sand with continuously renewed nutrient solutions, the best growth was obtained with the following partial volume-molecular concentrations: 0.0022 KILPO_4 , 0.0108 $\text{Ca}(\text{NO}_3)_2$, and 0.0043 MgSO_4 . All solutions in which KH_2PO_4 comprised more than one-eighth of the total salt concentration produced plants with short, stubby roots which usually showed brown discolorations.

Where two cultures, one with nitrate and one with ammonium, were adjusted to pH ranges from 3.4 to 6.4, the largest dry weights were made in the nitrate series at pH 4.6 and in the ammonium series at 6.4. Top growth was almost identical in the two best lots, but root growth was larger in the nitrate culture. Reducing sugars and starch were considerably higher in the roots from the nitrate series than in the roots from the corresponding ammonium series. The crowns, on the other hand, were almost identical in these components. Nitrate N was absent from plants in the ammonium series. The ammonium N was distinctly higher in the plants of the ammonium series. The endodermis, pericycle cells, xylem, cortex, and phloem were in descending order of acidity. Starch and ammonium usually accumulated in the acid zones and calcium oxalate in the less acid zones of the pith.

In soil experiments the best top growth in Keyport loamy sand was obtained at a reaction of pH 5.2 and in Sassafras loam at pH 6.4. There were indications that the strawberry responds to variations in pH value in much the same manner as do other crop plants.

Strawberry production in Ohio, L. HAVIS (*Ohio Sta. Bul. 626 (1942), pp. [1]+41, figs. 14*).—General information is offered on selection of sites, varieties, planting stock, soil preparation, planting, care during the summer of setting, fertilizers, mulching, irrigation, harvesting and marketing, renewing the planting, etc.

Where mother plants were set 18 in. apart in rows 3.5 ft. apart, some increase in yields was obtained from spacing the runner plants. The cost of hand spacing was large, however. A study in 1941 of the root distribution of Howard 17 (Premier) plants growing in Wooster silt loam showed a gradual reduction in weight of roots as depth increased. The upper 6 in. of soil contained 62 percent of the total fresh weight. The roots near the surface contained a lower percentage of moisture, probably because they were older. Where the straw mulch was removed from Howard 17 plants on April 10, 19, and 30, 1941, the yields were 6,852, 5,244, and 5,196 qt. per acre, respectively. The time of removing mulch influenced the peak of production more than the beginning or ending of fruiting.

Studies in tropical fruits.—XIII, Carbohydrate metabolism of the banana fruit during storage at 53° F. and ripening at 68° F., H. R. BARNELL (*Ann. Bot. [London], n. ser., 5 (1941), No. 20, pp. 607-646, figs. 12*).—Changes in the amounts of dry matter, starch, sucrose, glucose, fructose, glycosidic glucose, and in titratable acidity in the skin and pulp of two commercial grades of bananas were determined for various storage treatments and are described in detail. The linkage of biochemical investigations with concurrent studies of the respiration and internal gas relationships of the fruit is discussed as a basis for future work on storage problems. The biochemical investigations necessary to clarify further the chemical definition of "quality" in the banana are outlined, and their potential importance in contributing to knowledge of the fundamental metabolism of the fruit is stressed.

Lime-induced chlorosis of citrus in relation to soil factors, A. R. C. HAAS. (Calif. Citrus Expt. Sta.). (*Plant Physiol.*, 17 (1942), No. 1, pp. 27-51).—Studies of the soil conditions in chlorotic and healthy citrus orchards indicated that a calcareous soil is potentially, but not necessarily, an alkaline soil. Tree condition and soil pH values in orchards in certain citrus areas changed with increasing or decreasing elevations of the orchard location. At moisture percentages near or greatly above the moisture equivalents calcareous soils may be rather alkaline, while at low moisture contents they may be rather acid. The pH values in soil at the field moisture content and at the 1:5 soil:water ratio are usually lower in soils of healthy than in those of chlorotic orchards. The length of time that the roots of a tree in a calcareous soil are subjected to a given pH and hence the continuity of a given soil moisture percentage are important in the problem of chlorosis. In healthy citrus tree areas in calcareous soils, the moisture equivalents either decreased or remained unchanged with increasing depth. On the other hand, in chlorotic areas in calcareous soils the moisture equivalents increased steadily in heavy soils and abruptly increased in lighter soils with increasing depth.

[Floricultural studies by the Cornell Station] ([*New York*] *Cornell Sta. Rpt.* 1941, pp. 138-140).—Among studies, the progress of which is discussed, are the culture of *Alstroemeria pelegrina* as a greenhouse ornamental, causes of blindness in chrysanthemums, method of watering greenhouse roses and other florists' crops, and the use of wicks for watering potted plants and seed flats, all by K. Post; organic matter sources for the rose, by R. C. Allen and A. W. Boicourt; methods of planting and mulching roses, both by Allen; soil aeration for the rose, by Allen and Boicourt; soil and nutrient requirements for the lupine and delphinium, by Allen and K. E. Wheeler; and high-phosphate starter solutions for herbaceous plants, by Allen and Boicourt.

Dahlia variety test, 1941, H. L. COCHRAN, D. D. LONG, W. D. RICKS, and T. L. BISSELL. (*Georgia Sta. Cir.* 132 (1941), pp. 7, figs. 2).—This is a brief review of the results of the 1941 trials, supplemented with information on dahlia root storage and the control of certain insect pests. Peat moss was found to be an effective storage medium.

Further studies of cool storage and other factors affecting the forcing performance of Easter lily bulbs, P. BRIERLEY and A. H. CURTIS. (U. S. D. A.). (*Jour. Agr. Res.* [U. S.], 64 (1942), No. 4, pp. 221-235, figs. 2).—Creole Easter lily bulbs (*Lilium longiflorum*) dug in Louisiana on six dates (June 16 to August 16, 1939) were forced at Beltsville, Md., after various storage treatments. Lots stored for 5 weeks at 50° F. flowered in from 87 to 124 days after planting (October 23, 1939, to January 28, 1940, respectively); those stored for 10 weeks at 32° bloomed in from 135 to 152 days; and bulbs not cool-stored flowered in from 232 to 287 days. Bulbs from 50° storage flowered earlier and on shorter stems and produced fewer leaves than those from 32° or 80°, or those stored first at 80° and then at 32° or 50°. Storage at 50° was much more effective in hastening flowering when applied early (July) than when applied in August or September. Some individual bulbs, evidently immature when dug in June, were not at all accelerated in development by cool storing. Bulbs dug at different dates but cool-stored at the same period flowered at essentially the same time. Seedling Easter lily bulbs grown in Louisiana flowered earliest and those from Maryland latest after 32° storage; bulbs from California and North Carolina were intermediate in time of flowering. Creole Easter lilies affected with severe necrotic fleck mosaic bloomed later and bore fewer and smaller flowers than slightly affected plants.

FORESTRY

Forests and people: Report of the Chief of the Forest Service, 1941 (*U. S. Dept. Agr., Forest Serv. Rpt., 1941, pp. IV+40*).—Among subjects considered in this general administrative report are the social implications of forests; forest depletion; rural problem areas; public cooperation; public ownership and regulation; and the work of the Forest Service in land planning, forest economics, forest management, cooperation with States and private owners, cooperation with the Civilian Conservation Corps, and in administering the national forests. Information is presented also as to new forest legislation.

[**Forestry studies by the Cornell Station**] (*[New York] Cornell Sta. Rpt. 1941, pp. 99, 142-143*).—Included are brief progress reports on the following studies: The influence of fertilizers on the growth of forest trees, by R. F. Chandler, Jr.; improved practice in the production of forest planting stock of broadleaved timber species, by E. F. Wallihan and L. G. Cox; and the establishment, culture, and development of forest plantations, by Wallihan and G. W. Abel.

[**Silvicultural research notes**] (*Canada Dept. Mines and Resources, Lands, Parks, and Forests Branch, Forest Serv., Silv. Res. Notes Nos. 65 (1941), pp. [5]+56+[37], pls. 2, figs. 17; 66, pp. [3]+60, pl. 1; 67, pp. [2]+19, figs. 8; 68, pp. [3]+26, figs. 7*).—Included are four mimeographed reports on work at Lake Edward, Champlain County, Que.: No. 65, Site-Types and Rate of Growth, by R. G. Ray; No. 66, Forest-Site Classification and Soil Investigation on Lake Edward Forest Experimental Area, by C. C. Heimburger; and No. 67, Cleaning of Scattered Young Balsam Fir and Spruce in Cut-Over Hardwood Stands, and No. 68, Improvement Cuttings in Intolerant Hardwood—Conifer Type, both by G. A. Mulloy.

Factors affecting income from second-growth forests in the western Sierra Nevada, H. R. JOSEPHSON. (Coop. U. S. D. A.). (*California Sta. Bul. 658 (1941), pp. 72, figs. 18*).—The purpose of this study was "to present some basic information on factors that influence the profitability of forest management in second-growth pine stands of the Sierra Nevada. Included in this investigation are data on the yield of wood and the grades and quality of lumber obtainable from second-growth ponderosa pine stands. Economic factors influencing market demands, lumber prices, and production costs are analyzed, since the utilization practices of owners of timber and sawmills are determined in part by trends in these general economic conditions. Methods of cutting and stand management are likewise considered as important factors influencing timber yields and forest incomes. The combined effect of these various factors is illustrated finally by estimation of the probable timber growth, costs, and incomes involved in timber management and utilization on a specific forest property."

Prairie soil as a medium for tree growth, D. P. WHITE. (Wis. Expt. Sta.). (*Ecology, 22 (1941), No. 4, pp. 398-407, figs. 7*).—Greenhouse trials showed definitely that the early development of both conifers and hardwoods is adversely affected by some inherent deficiency of prairie soils, irrespective of the environment. Chemical analyses revealed that the virgin prairie soils were somewhat deficient in available phosphorus and potassium, but not to such an extent as to cause an early degeneration of the trees. No adverse influence could be attributed to either carbon : nitrogen or calcium : magnesium ratios.

The application of fertilizer, including major and minor elements, to prairie soil resulted in only about half the growth of red and green ash and American elm obtained on unfertilized forest soils. Analyses of elm seedlings showed

about the same contents of nitrogen, phosphorous, and calcium but a much lower potassium content in the plants on prairie soil. Red and white pine seedlings grown in prairie soil with the addition of 10 percent of humus sand from a forest nursery grew better than in prairie soil alone. Apparently mychorizas did not merely increase the availability of soluble nutrients but exerted a specific growth-promoting action.

Effect of subsoil acidity and fertility on the growth of seedling black locust and green ash, A. L. McCOMB and F. J. KAPEL. (Iowa Expt. Sta.). (*Plant Physiol.*, 17 (1942), No. 1, pp. 7-15, figs. 2).—Seedling black locust and green ash trees growing in crocks containing a very acid infertile soil, the pH of which was maintained at four levels (4.3, 6.6, 6.9, and 7.7), were supplied with no fertilizer, N and K, and N, P, and K. Irrespective of pH level, both species grew very poorly where no fertilizer was added and responded markedly to NPK treatment at all levels. Very little growth was made in response to N and K, indicating that P was the most limiting element. Both species developed best at pH 4.3 when P was added, and growth decreased as pH values increased. When P was omitted the growth of both species increased up to 6.9 and decreased again at pH 7.7. The practical value of fertilizing seedlings when reforesting badly eroded sites of this particular soil series was indicated.

Wood structure of *Thuja occidentalis*, M. W. BANNAN (*Bot. Gaz.*, 103 (1941), No. 2, pp. 295-309, figs. 43).—Studies of samples from different parts of the tree, from trees of different sizes, and from roots under different environmental conditions revealed many variations in structure, which are described and illustrated in detail. In view of such variability it is deemed obvious that caution should be exercised in selecting diagnostic characters for wood of this tree.

DISEASES OF PLANTS

[Plant disease work by the Bureau of Entomology and Plant Quarantine] (*U. S. Dept. Agr., Bur. Ent. and Plant Quar. Rpt.*, 1941, pp. 22-23, 38-42, 42-48, 59-65).—Reports of progress are included on phony peach and peach mosaic control and eradication, citrus canker eradication, Dutch elm disease eradication, white pine blister rust control, and barberry eradication for wheat stem rust control.

The Plant Disease Reporter, [March 1 and 15, 1942] (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr.*, 26 (1942), Nos. 4, pp. 83-94, fig. 1; 5, pp. 95-124, figs. 7).—In addition to the host-parasite check-list revision, by F. Weiss (Nos. 4-5, *Quercus*), the following items are noted:

No. 4.—First report of late blight of potato in Colorado, by W. A. Kreutzer and J. G. McLean; prevalence of certain pea diseases in the Palouse section of Idaho in 1941, by W. J. Virgin; Spergon as a seed disinfectant, by R. W. Leukel; and only report of phony peach in Oklahoma, by K. S. Chester.

No. 5.—Notes on plant diseases in North Carolina in 1941, including those of apple by J. A. Lyle and L. Shaw, cotton by S. G. Lehman, potato by L. W. Nielsen, peach by L. Shaw, peanut by L. Shaw and T. T. Hebert, small grains by H. R. Garriss, soybeans by Lehman, flue-cured tobacco by K. J. Shaw and T. E. Smith, and vegetable crops (crucifers, cucurbits, lettuce, pepper, sweetpotato, and miscellaneous) by D. E. Ellis and S. Cox; fruit diseases in the Ozark section of Arkansas in 1941 (apple, peach, plum, and cherry), by J. C. Dunegan; heat injury to the leaves of California black oak (*Quercus kelloggii*) and some other broadleaves, by J. L. Mielke and J. W. Kimmey; overwintering of crown rust of oats in Arkansas in 1941-42, by H. R. Rosen; and current reports on apple scab development in Illinois and tobacco plant bed diseases in Georgia.

The Plant Disease Reporter, Index to Volume XXV, 1941, N. W. NANCE (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr.*, 25 (1941), *Index*, pp. 593-630).—This subject index covers hosts, parasites, and common names of diseases and injuries.

[Abstracts of phytopathological papers] (*Amer. Jour. Bot.*, 28 (1941), No. 10, pp. 3s, 6s, 11s).—The following are included: Frost Injury Artificially Induced in Arizona Cypress, and Apparatus for the Production of Artificial Frost Injury in Living Plant Tissues, both by W. S. Glock and R. A. Studhalter; and An Hypothesis Accounting for Non-Linear Dosage-Response Curves [of Fungicides], by A. E. Dimond (Conn. [New Haven] Expt. Sta.).

[Plant diseases] (*Va. Acad. Sci. Proc.*, 1941, pp. 175, 176, 177-178, 182).—Abstracts of the following papers are included: Results of a Three Year Study on the Control of *Cercospora* Leaf Spot of Peanuts, by L. I. Miller (Va. Expt. Sta.); Further Observations on a Perennial Woody Gall on Hickory, by A. F. Chestnut; Physiologic Studies of Some Entomogenous Fungi, by J. G. Harrar and J. W. Showalter (Va. A. and M. Col.); and Developing a Wilt Resistant Spinach Variety for Virginia, by T. J. Nugent and H. T. Cook, and Developing Wilt Resistant Watermelons for Virginia, by H. T. Cook and T. J. Nugent (both Va. Truck Sta.).

Informe del departamento de fitopatología [Report of the department of phytopathology], A. B. CORREA ([Colombia] *Min. Econ. Nac. Mem.* 3 (1940), pp. 101-125).—Progress reports are included on phytopathological studies, with special reference to diseases of sugarcane and rice.

[Plant disease studies by the Missouri Station]. (Partly coop. U. S. D. A.). (*Missouri Sta. Bul.* 438 (1941), pp. 31-34, 63, 66, 90).—Reports of progress by M. A. Smith, C. M. Tucker, J. E. Livingston, G. W. Bohn, J. T. Middleton, L. J. Stadler, G. F. Sprague, J. G. O'Mara, E. R. Sears, L. Smith, C. G. Vinson, and C. G. Schmitt are made relative to studies on the epidemiology and control of apple scab and apple blotch control; barley seed treatment for smut, and resistance inheritance to *Ustilago nuda* in barley; breeding tomatoes for *Fusarium* wilt resistance; *Pythium* spp. attacking fibrous-rooted begonia, pumpkin, watermelon, and tomato; effects of seed treatment on oat yields; corn seed treatment for seedling blights; active crystalline fraction of tobacco mosaic virus; control of mushroom disease (cause unknown); annual incidence of bacterial canker of sweet cherry nursery stock; inbred strains of *Ustilago zeae*; and *Sclerotinia* stem rot on *Centaurea cyanus* and *Delphinium ajacis*.

[Phytopathological work by the Cornell Station]. (Partly coop. U. S. D. A. and N. Y. State Expt. Sta.). ([*New York*] *Cornell Sta. Rpt.* 1941, pp. 146-153).—Brief reports by D. S. Welch, K. G. Parker, L. J. Tyler, S. Pope, W. Mai, F. A. Haasla, C. E. Williamson, W. H. Burkholder, F. M. Blodgett, C. S. Tuthill, P. Decker, J. B. Skaptason, S. G. Younkin, E. D. Hansing, L. C. Peterson, W. M. Epps, A. B. Burrell, W. D. Mills, L. M. Massey, F. H. Lewis, L. A. Brinkerhoff, C. Chupp, R. G. Palmer, A. W. Dimock, V. L. Frampton, J. D. Rebstock, E. M. Hildebrand, D. H. Palmiter, J. M. Hamilton, L. O. Weaver, D. Reddick, A. G. Newhall, and B. G. Chitwood are included on investigations of the Dutch elm disease; diseases of narcissus and other flowering bulbs; nomenclature, classification, and physiology of phytopathogenic bacteria, including *Phytomonas manihoti*, and the new species *P. allitcola*, *P. caryophylli*, *P. barbareae*, and *P. gardeniae*; rotation in relation to potato scab; effects of virus diseases on potato yields; potato yellow dwarf; factors influencing the efficiency of potato spraying and dusting; nonburning summer fungicides for apples; field testing of fungicides for apple scab; club root control on cabbage and cauliflower; control of diseases of miscellaneous ornamentals grown under glass; *Verticillium*

disease of chrysanthemums and other greenhouse ornamentals; virus diseases of potatoes; yellow-red virosis (reds or X-disease) of peach and chokecherry; *Sclerotinia fructicola* cankers on peach; permanent crop improvement through control of diseases by developing immune or resistant stocks; bulb nematode disease of onions; and onion smut control.

Epiphytes, parasites, and geophytes and the production of alkaloids, cyanogenetic, and organic sulphur compounds, J. B. McNABE (*Amer. Jour. Bot.*, 28 (1941), No. 9, pp. 733-737).—The author attempts to show that epiphytes and total parasites, which generally have lower concentrations of electrolytes, especially S and nitrogenous radicals, in their leaf saps than geophytes or partial parasites, are less likely than the latter to produce alkaloids and cyanogenetic and organic S compounds. The electrical conductivity of the expressed sap of a saprophyte (*Monotropa*) was lower than for epiphytes or for total or partial parasites, that of epiphytes less than that of total parasites, geophytes, or partial parasites, that of total parasites intermediate between that of epiphytes and partial parasites, and the average for partial parasites above that of total parasites and geophytes. The sulfate concentration in epiphytes was of approximately the same magnitude as that of total parasites, whereas both of these measurements were decidedly lower than those of the partial parasites. No volatile S compounds or cyanogenetic glucosides were found in epiphytes or in total or partial parasites. No alkaloids were determined in epiphytes or total parasites, but among the partial parasites an alkaloid was discovered in the Lorantheae. The occurrence of alkaloids and of cyanogenetic and organic S was in accordance with the law of mass action, though it is to be noted that other factors, such as genetic strain, may be influential.

A laboratory apparatus for studying settling rate and fractionation of dusts, J. W. HEUBERGER and N. TURNER (Conn. [New Haven] Expt. Sta.). (*Phytopathology*, 32 (1942), No. 2, pp. 166-171, figs. 2).—"An apparatus is described for use in studying the settling rate and fractionation of dusts. The features of this apparatus are a settling tower of simple design, an exposure chamber for making serial exposures of slides or leaves to the dust cloud in the settling tower, a dust magazine (charge tube) from which almost instantaneous and complete discharge can be obtained by an air blast, and a simple mechanism for introducing known charges of dust into the settling tower. Consistent results have been obtained with this apparatus."

Predaceous fungi, C. DRECHSLER (U. S. D. A.). (*Biol. Rev. Cambridge Phil. Soc.*, 16 (1941), No. 4, pp. 265-290).—This is a review with 87 references. Of the 56 fungi reported as subsisting by capturing motile animals, 25 are intimately related Hyphomycetes, 28 are Phycmycetes (Zoopagaceae), and 1 belongs to the Saprolegniaceae. The remaining 2 (aquatic Phycmycetes) have most often been referred to the Pythiaceae, but they may belong to the Zoopagaceae. Invasion of nematodes by assimilative hyphae promptly results in conspicuous fatty degeneration of the musculature and organs. Invasion of amoebae and shelled rhizopods causes relatively little immediate degeneration, the organisms apparently remaining alive until their sarcodic materials have in large part been expropriated.

Aerial dissemination of plant pathogens, J. H. CRAIGIE (6. *Pacific Sci. Cong., Calif.*, 1939, *Proc.*, vol. 4, pp. 753-767).—A comprehensive review, with 82 references.

Three bacterial plant pathogens: *Phytomonas caryophylli* sp. n., *Phytomonas alliiicola* sp. n., and *Phytomonas manihotis* (Arthaud-Berthet et Bondar) Viegas, W. H. BURKHOLDER (Cornell Univ.). (*Phytopathology*, 32 (1942), No. 2, pp. 141-149).—The author describes *P. caryophylli* n. sp., cause

of a wilt and root rot of carnations; *P. alliicola* n. sp., cause of a bulb rot of onions; and *P. manihotis*, cause of a wilt of cassava and of which no adequate description has hitherto been given. There are 21 references.

Geographical distribution of virus diseases of plants with special reference to the Philippines, G. O. OCREMIA (6. *Pacific Sci. Cong., Calif., 1939, Proc., vol. 4, pp. 745-748*).

Physikalisch-chemische Gesichtspunkte zum Problem der Virusaktivität [Physicochemical viewpoints in relation to the problem of virus activity], L. HOLZAPFEL (In *Advances in Enzymology and Related Subjects, 1*, edited by F. F. NORD and C. H. WERKMAN. New York: Interscience Pubs., Inc., 1941, vol. 1, pp. 43-62, figs. 7).

Further studies on the ultrafiltration of plant viruses, K. M. SMITH and W. D. MACCLEMENT (*Parasitology, 33* (1941), No. 3, pp. 320-330, figs. 5).—In a previous paper³ the authors described the membrane filtration of *Nicotiana* virus 11 (tobacco necrosis virus) and made certain suggestions to explain the peculiarity of the filtration curve. Here, they describe ultrafiltration studies of nine viruses, among which it is shown that three—*Lycopersicum* virus 4 (tomato bushy stunt virus), *Nicotiana* virus 11, and *Nicotiana* virus 12 (tobacco ring spot virus)—filter in a consistent manner and appear to have approximately spherical particles. The filtration end point of 40 m μ was the same in each case, and from this a particle diameter of 13-20 m μ was calculated. There was, however, a peculiarity in the filtration curve of tobacco necrosis virus which showed itself in a "bench" or "shelf" and which suggested either a polydisperse system or some degree of dissymmetry in particle shape. There was great difficulty in filtering *Nicotiana* virus 1 (tobacco mosaic virus). A value of 13-20 m μ was obtained for the particle diameter, which agrees well with measurements by other methods. However, the filtration results suggested that the infective units are not of the same length and that this variability may be considerable. Similar difficulty was experienced in filtering *Solanum* virus 1 (potato virus X), another rod-shaped virus the end point of which was 100 m μ , with a calculated particle diameter of 33-50 m μ . A definite filtration end point was not obtained for *Cucumis* virus 1 (cucumber mosaic virus), probably because of the low initial concentrations of virus in the extracted sap.

Virus-antagonism tests and their limitations for establishing relationship between mutants and nonrelationship between distinct viruses, H. H. MCKINNEY. (U. S. D. A.). (*Amer. Jour. Bot., 28* (1941), No. 9, pp. 770-778).—Virus domination may be regarded as a form of antagonism. Since complete domination did not obtain in all combinations of closely related mutants in these studies, incomplete domination of one virus over another in a plant cannot be regarded as evidence against a close natural relationship among the viruses. Domination is quantitative. Potato and cucumber mosaic viruses have generally been considered unrelated to *Nicotiana* virus 1, yet they reduced the number of local necrotic lesions induced by certain strains of the last. The degree of domination by a virus is influenced by the host. When two systemic viruses are combined, dominance must be determined by inoculation tests rather than by symptoms. Domination is not always by the virus inducing the more severe symptoms. Because the virus-domination reaction appears restricted in application to certain very closely related virus strains, it virtually fails to meet the requirements necessary for proving natural relationships and nonrelationships on a comprehensive scale, but the reaction may serve for virus differentiation and identification without regard to such relationships.

³ *Parasitology, 32* (1940), No. 3, pp. 320-332, pl. 1, figs. 7.

Studies in the genus *Colletotrichum*.—II, Physiological studies on *Colletotrichum falcatum* Went., T. S. RAMAKRISHNAN (*Indian Acad. Sci. Proc.*, 14 (1941), No. 4, Sect. B, pp. 395-411, pl. 1, figs. 2).—Studies of the culture characters are presented. A light colored saltant was formed, the two strains having similar temperature relations but exhibiting differences in sporulation, pathogenicity, amount of growth, and color. Growth was inhibited by *Trichoderma lignorum* in paired cultures, but the autoclaved extract had no inhibitory influence. An *Aspergillus* species also inhibited the fungus in culture, and in this case the autoclaved extract had a similar effect. The enzymes produced by the two strains are discussed.

Treze novas espécies de "Elsinoë" do Brasil (Thirteen new species of Elsinoë from Brazil), A. A. BITANCOURT and A. E. JENKINS (*Arq. Inst. Biol. [São Paulo]*, 12 (1941), pp. 1-20, pls. 17; *Fng. abs.*, pp. 15-16).—Technical descriptions are given for 13 new species collected on various host plants in the States of Rio de Janeiro (2) and São Paulo (11).

The development and structure of the conidia of *Erysiphe polygoni* DC. and their germination at low humidity, H. J. BRODIE and C. O. NEUFELD (*Canad. Jour. Res.*, 20 (1942), No. 1, Sect. C, pp. 41-61, figs. 5).—Germination occurred at relative humidities of about 0-100 percent. The conidia were never observed to germinate in situ, and they are passively discharged. The wall is relatively impervious to water and probably also to gases, which offers an explanation of germination under dry conditions. The attachment papilla provides a permeable spot in the spore wall which is not exposed until the conidium leaves its conidiophore. On exposure to air, CO₂ is allowed to pass out and O₂ to pass in, thus allowing respiration and other germination processes to begin. When freshly detached conidia were held in a 10 percent CO₂ atmosphere germination was checked, but they germinated perfectly when removed from the CO₂. Germination was also checked in a N atmosphere. No observable shrinkage occurred during germination, but shriveling and collapse took place when death was imminent. Details of conidial development are given.

The species concept in *Fusarium* with reference to section *Martiella*, W. C. SNYDER and H. N. HANSEN. (*Univ. Calif.*). (*Amer. Jour. Bot.*, 28 (1941), No. 3, pp. 738-742).—The simplified revision presented of the classification and nomenclature of the three species, seven varieties, and three forms of *Fusarium* in this section was necessitated by the wide range of variability and overlapping in cultural type and morphology in these fungi, a situation which made difficult and impractical the system now in use.

The effect of chemicals on *Fusarium oxysporum cubense* growing in the soil, C. H. MEREDITH (*Phytopathology*, 32 (1942), No. 2, pp. 182-184).—Of 100 chemicals tested, the fungus was killed by 43 and for these the toxic and non-toxic concentrations in chemical and soil culture mixtures are listed. There was considerable variation in the effects of the different chemicals, e. g., a 30 percent mixture of Na bicarbonate failed to kill, whereas ethyl mercury iodide was toxic at 25 p. p. m.

***Pseudomonas aeruginosa*: Plant pathogen, A. C. BRAUN and R. P. ELROD** (*Jour. Bact.*, 43 (1942), No. 1, pp. 40-41).—An abstract.

A revised check list of the parasitic fungi on cereals and other grasses in Oregon, R. SPRAGUE. (*Coop. Oreg. Expt. Sta.*). (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr.*, 1942, Sup. 134, pp. 36).—The two lists previously noted (*E. S. R.*, 73, p. 701; 78, p. 491) are here combined, together with further additions, making 677 citations of fungi on separate hosts.

Serological studies of the *Erwineae*.—II, Soft-rot group, with some biochemical considerations, R. P. ELROD. (*Ohio State Univ.*). (*Bot. Gaz.*,

103 (1941), No. 2, pp. 266-279).—In continuation (E. S. R., 86, p. 500), 18 *Erwinia carotovora* cultures were tested for fermentative ability in 26 substances. Ten were active on maltose, with formation of acid alone or plus gas. The 8 maltose—organisms were agglutinated in 33.3 percent of cases with maltose—antisera, and there was a 28.6 percent cross-reaction with maltose+ cultures and maltose+ antisera. Between the 2 fermentative groups there was but 7.5 percent of cross-reaction. The total number of cross-agglutination tests produced with 13 antisera was 18.1 percent, the majority occurring within the 2 fermentative groups. Separation on the basis of sorbitol fermentation may also be found significant. The correlation between maltose fermentation and serological groups seems to bear out the theory that there are 2 soft-rot pathogens, though they show among themselves considerable variation in fermentative powers and antigenic structure. The common antigenic components of the group are bound up in the flagella, and adsorption tests indicated a large number of flagellar components. The somatic fractions are shown to be type-specific, but there was some evidence of common factors here also. Carbohydrate materials extracted from these bacteria proved to be specific, and paralleled the somatic results. The somatic fractions are believed to owe their specificity to these carbohydrates. There are 23 references.

The effect of certain powder disinfectants on the control of leaf spot in oats. P. T. CARROLL ([*Irish Free State*] *Dept. Agr. Jour.*, 37 (1940), No. 1, pp. 79-92, pls. 4).—The results reported appeared to indicate that seed treatment with dust mercurials for *Helminthosporium avenae*, while effective in control under the conditions of experimentation, did not in all cases result in increased grain yields, as, e. g., where the amount of infection on the seed or the conditions during germination, or both, were such that seedling establishment was not markedly less from untreated than from treated seed. When, however, seed infection is high and conditions are favorable to the disease, significant reductions in yield from untreated seed may be expected. The relations of weather v. infection are discussed.

Diseases of rice. E. C. TUTTLE. (U. S. D. A. coop. Ark., La., and Tex. Expt. Stas.). (*Rice Jour.*, 44 (1941), Nos. 10, pp. 5-8; 11, pp. 4, 12).

Physiologic specialization of *Puccinia graminis tritici* in Argentina, Chile, and Uruguay. J. VALLEGA (*6. Pacific Sci. Cong.*, Calif., 1939, *Proc.*, vol. 4, pp. 769-774).—Seven races were identified, viz, 11, 14, 15, 17, 21, 36, and 42. Races 17 and 42 were most prevalent and widely distributed in Argentina and Uruguay. In Chile, race 15 was generally distributed, 14 was most common in the north, 17 in the central region, and race 11 in the south. The prevalence of races attacking durum wheats is deemed noteworthy. All races found in South America have been reported also from North America except race 42, previously known only in India and Africa.

New physiologic races of *Tilletia tritici* and *T. levis*. C. S. HOLTON and H. A. RODENHISEL. (U. S. D. A. coop. Idaho, Mont., Oreg., Utah, and Wash. Expt. Stas.). (*Phytopathology*, 32 (1942), No. 2, pp. 117-129, fig. 1).—Three new races of *T. tritici* and two of *T. levis* are described and numbered, bringing the total known races to 14 of the former and 10 of the latter. Some races of the two bunt fungi were distinguishable by one or more of the following criteria, other than pathogenicity: Bunt-ball size, shape, and water absorptive properties; chlamydospore size, echinulation, and color; capacity to stunt the hosts and to stimulate excessive tillering; and incomplete smutting and capacity to intensify glume pigmentation. Race T-11 gave rise to T-13, one of the new races, indicating that some races are pathogenically unstable. Most of the races, however, proved highly stable in tests on winter wheats at Pullman, Wash.

Variability in reaction of wheat differential varieties to physiologic races of *Tilletia levis* and *T. tritici*. H. A. RODENHISER and C. S. HOLTON. (U. S. D. A. coop. Idaho, Minn., Mont., Oreg., Utah, and Wash. Expt. Stas.). (*Phytopathology*, 32 (1942), No. 2, pp. 158-165).—Bunt studies at seven experiment stations demonstrated that a difference in environmental conditions may affect the response of some spring wheat varieties to certain races of *T. levis* and *T. tritici*, but the effect is not evident with some other varieties and races. The Ulka variety was constant in its reaction to the races to which it is susceptible. Marquis, on the other hand, was so variable in response to certain races at different stations that, according to the race classification used, it would be classed as resistant, intermediate, or susceptible to those races, depending on the location of the tests. In contrast, this variety maintained a high degree of resistance to race T-9 at all stations where it was sown in spring. Canus was variable in response in the different localities to the races to which it is susceptible, but was constant in reaction to the races to which it is resistant.

The most probable explanation for these results is that the expression of genetic factors for protoplasmic resistance in the host is modified differently by environment in the different varieties. The data obtained tend to increase the complexity of race identification and of testing for smut resistance in spring wheats. At two stations relatively high percentages of infection were obtained on the susceptible check variety, Ulka, and some differences seem evident in the pathogenicity of certain races on Marquis and Canus. At three other stations the separation of the races was more distinct, while at Aberdeen, Idaho, the environmental conditions were nearly optimum for infection and for demonstrating the potentialities of individual races. It thus seems evident that tests for varietal resistance should not be confined to a single area.

Physiologic specialization in Japanese wheat rusts. H. ASUYAMA (6. Pacific Sci. Cong., Calif., 1939, Proc., vol. 4, pp. 775-778).—Of the nine physiologic races of leaf rust (*Puccinia rubigo-vera tritici*) in Japan, only two are said to have been identified in Europe and North America. A single race of *P. graminis tritici*, related to race 81, is reported throughout Japan, where the alternate hosts (*Berberis* spp.) are rare. Of stripe rust (*P. glumarum tritici*), only race 31 was known to the author.

Some leaf spot fungi on western Gramineae. R. SPRAGUE. (U. S. D. A. coop. Oreg. and N. Dak. Expt. Stas.). (*Mycologia*, 33 (1941), No. 6, pp. 655-665, fig. 1).—The following are described and discussed: *Phyllosticta owensii* n. sp. on *Dactylis glomerata*, *P. anthoxella* n. sp. on *Anthoxanthum odoratum*, *P. roglerii* n. sp. on *Digitaria sanguinalis*, *P. sorghina* on *Setaria viridis* and *Tricholaena rosea*, *Stagonospora subseriata* on various hosts, *Robillarda agrostidis* on *Buchloe dactyloides*, *Coniothyrium psammae* on *Calamagrostis nuttallensis*, and *Septoria secalis stipae* n. var. on *Stipa viridula*. There are 19 references.

Physiological resistance to halo blight in beans. J. H. JENSEN and R. W. Goss. (Nebr. Expt. Sta.). (*Phytopathology*, 32 (1942), No. 3, pp. 246-253, figs. 3).—The development of small, inconspicuous necrotic lesions on leaves of some bean varieties inoculated with halo blight (*Phytomonas medicaginis phaseolicola*) instead of the large chlorotic spots seen on susceptible varieties, suggested physiological resistance in the former. These symptoms occurred on leaves of Red Mexican and Schwert No. 27 at 16°, 22°, and 28° C., and on early seedlings to nearly mature plants. Inoculations of germinated seed by soaking in a bacterial suspension or of young plants by stem punctures failed to bring about systemic infection. Pod inoculations produced small, rusty-colored necrotic lesions on these two varieties instead of the usual large,

water-soaked type. It is thus concluded that these and other varieties reacting similarly possess true physiological resistance to halo blight.

The complex nature of white-clover mosaic, F. JOHNSON (*Phytopathology*, 32 (1942), No. 2, pp. 103-116, figs. 2).—This disease, previously regarded as due to a single virus (*Trifolium virus 1*) is shown to be induced by a mixture of two distinct viruses, viz, pea-mottle virus and pea-wilt virus. Their separation was accomplished because pea-wilt virus infected cowpea, a host resistant to pea-mottle virus, and only the latter was transmitted by dodder. When the two viruses in combination were transferred to peas, streak was produced, resulting in death of the plants in a manner similar to that produced by the *Trifolium virus 1* complex. Pea-mottle virus alone produced a systemic mosaic disease when transferred to several pea varieties, and was infectious for members of the Caryophyllaceae, Chenopodiaceae, Cucurbitaceae, Scrophulariaceae, and Leguminosae. In the tests conducted, pea-wilt virus proved infectious for the Leguminosae only, and produced no mottling in pea varieties, except a very mild mosaic in the Alaska and Canada White varieties. In general, plants were more severely affected by the pea-mottle than by the pea-wilt virus. No intracellular inclusions could be detected in plants infected with either virus, and no virus transmission was obtained via the pea aphid (*Macrosiphum pisi*). Pea-mottle virus was inactivated in 10 min. at 60°-62° C., pea-wilt virus at 58°-60°. In dilutions, pea-mottle virus was recovered at 1:10,000 in water and pea-wilt virus at 1:100,000. Both withstood aging in vitro and in dried host tissues for at least 31 days and passed a Berkefeld W filter. *Marmor efficiens* n. sp. is suggested for pea-mottle virus and *M. repens* n. sp. for pea-wilt virus. There are 26 references.

Bacterial wilt of dent corn inbreds, C. ELLIOTT. (U. S. D. A.). (*Phytopathology*, 32 (1942), No. 3, pp. 262-265).—Late infection of dent corn in the field with *Xanthomonas* (= *Phytomonas*) *stewartii* has not only caused losses in green tissue but has also apparently increased the *Diplodia* stalk rot susceptibility. Such losses in yield led to studies of the relative resistance to wilt of inbred parent lines used in producing hybrid dent corn. Hypodermic inoculations of water suspensions of the pathogen indicated that these inbred lines are more resistant in their early growth stages than they are to natural leaf blight infection on maturing plants, and that seedling infection is not a safe index of susceptibility to late leaf blight. Some inbreds proved resistant and others susceptible to the latter. These differences indicate promising possibilities for developing resistant hybrids, which is the only practical means of controlling the leaf blight phase of bacterial wilt.

Physiological studies on two species of *Diplodia* parasitic on corn, W. E. WILSON. (Univ. Ill.). (*Phytopathology*, 32 (1942), No. 2, pp. 130-140).—The source of inoculum of *D. macrospora* was correlated with the ability of this fungus to grow on simple sugars in the basic medium. A substance enabling it to develop on media containing simple sugars was obtained from corn, oats, sugar beets, molasses, its own hyphae from vigorously growing cultures, and a dextrose medium staled by *D. zeae*. An invertase solution and a commercial biotin concentrate also promoted growth. The growth substance elaborated by *D. zeae* and present in a concentrate of dextrose media staled by this fungus is believed to be biotin or a closely related compound. Tests on samples from various stages of the process of converting starch to dextrose indicated that the growth factor in starch is not present in dextrose in significant amounts, but remains in the mother liquor removed from the dextrose after crystallization. Growth of *D. macrospora* was definitely influenced by the source of the maltose and sucrose supplied in the media. It can utilize complex carbohydrates in many

instances only because they contain as an impurity a required growth factor, which apparently is removed from simple sugars during manufacturing processes. There are 21 references.

Internal grain infection in maize due to *Gibberella fujikuroi* and *Gibberella fujikuroi* var. *subglutinans*, E. T. EDWARDS (*Jour. Austral. Inst. Agr. Sci.*, 7 (1941), No. 2, pp. 74-82, figs. 3).—Laboratory inoculations indicated that little if any internal grain infection by these fungi could be established in mature corn ears, even under conditions highly favoring the pathogen, but maintenance of such ears in a warm moist atmosphere for 7 days caused a slight increase in incidence of spontaneously occurring internal grain infection by *G. fujikuroi* and other organisms. In the field, infection tests gave a high incidence of internal grain infection by the above fungi from inoculations at all stages from pollination to near maturity, though the highest incidence followed inoculations between pollination and the dent stage. Injury of the husk and maintenance of the ear under moist atmospheres were important factors. Ears thus treated up to the dent stage also developed considerable kernel rot, but this was not apt to follow unless the grain had been injured.

Isolation and infection tests with seed- and soil-borne cotton pathogens, W. W. RAY and J. H. McLAUGHLIN. (Okla. Expt. Sta.). (*Phytopathology*, 32 (1942), No. 3, pp. 233-238).—Though highly pathogenic, *Glomerella gossypii* is probably of little importance in Oklahoma because of its infrequent occurrence. Strains varying in pathogenicity apparently exist in *Fusarium moniliforme*, *F. vasinfectum*, *F. scirpi*, and *Sclerotium bataticola*, as evidenced by the weighted indices of infection. *S. bataticola* (*Rhizoctonia bataticola*), although common in Oklahoma soils, is of slight consequence to cotton seedlings. *F. moniliforme*, though not highly virulent, might conceivably become, because of its frequent occurrence, a serious cotton-seedling parasite under favorable conditions. The majority of the other species of *Fusarium* and those of *Alternaria*, *Penicillium*, *Chaetomium*, *Aspergillus*, and *Rhizopus* are not considered important cotton-seedling parasites in Oklahoma, either from lack of virulence or scarcity in the soil. *Rhizoctonia solani*, because of its high virulence under various conditions and its frequency in Oklahoma soils, is considered the most important fungus involved in cotton-seedling diseases. Its real importance may not be indicated by the actual percentage of isolation for several reasons: The evidence indicates that seedlings cannot be satisfactorily protected against this organism by seed treatments thus far employed; it was observed that Ceresan-dusted seed planted in soil heavily infested with this fungus often did not emerge at all; and it is conceivable that the long skips in rows commonly observed throughout the State may be due largely to a high inoculum potential in the soil.

A convenient soil-culture method for obtaining sclerotia of the cotton root rot fungus, A. A. DUNLAP. (Tex. Expt. Sta.). (*Amer. Jour. Bot.*, 28 (1941), No. 10, pp. 945-947, fig. 1).—Sclerotia of *Phymatotrichum omnivorum* are reported to have been consistently obtained in sterile-soil cultures with a nutrient, such as seeds of sorghum, cotton, bean, or cowpea, added. This method proved effective under a wide range of moisture, nutrient, temperature, and soil conditions. Variations in size of sclerotial masses were noted with different types of nutrients and when sand was used in place of soil.

Prevention of seed-borne diseases in the flax crop, A. E. MUSKETT and J. COLHOUN (*Nature* [London], 148 (1941), No. 3746, pp. 198-199).—A note on promising results from seed treatment with "Nomersan," a proprietary product containing tetramethylthiuram disulfide.

Diseases of potatoes in Idaho, J. M. RAEDER (*Idaho Agr. Col. Ext. Bul.* 137 (1940), pp. 35, figs. 18).—A popular account.

Some observations on bacterial ring rot in late crop seed, P. B. MOTT (*N. J. State Potato Assoc., Hints to Potato Growers*, 22 (1941), No. 8, pp. [1-2]).—Notes on sources of infection of the potato plant and control.

New chlorinated lime treatment removes Rhizoctonia and disinfects potato tubers, W. E. BRENTZEL (*North Dakota Sta. Bimo. Bul.*, 4 (1942), No. 3, pp. 20-21, fig. 1).—From the tests reported it is believed that chlorinated lime treatment (24 percent available Cl) may prove very useful as a disinfectant for table stock potatoes, as a detergent to remove *Rhizoctonia* and improve the appearance of the tubers, and as preventives of tuber decay in transit and storage and of dissemination of bacterial ring rot and other diseases from seed stock.

Treatment removes Rhizoctonia from potato tubers, W. E. BRENTZEL (*N. Dak. Expt. Sta.*). (*Amer. Potato Jour.*, 19 (1942), No. 1, pp. 16-17).—Essentially the same as noted above.

An unusual spotting of potato tubers and its cause, R. MCKAY (*[Irish Free State] Dept. Agr. Jour.*, 37 (1940), No. 1, pp. 93-95, pls. 2).—As a result of numerous experiments it was concluded that the spotting of the tuber lenticels referred to was caused by rat excrement, the urine being mainly responsible. Pit rot is compared, and both types of trouble are illustrated.

A identificação das doenças de virus encontradas nos campos de multiplicação de tuberculos-sementes de batatinha [Identification of the virus diseases encountered in potato seed tuber multiplication fields], K. SILBERSCHMIDT, N. R. NOBREGA, and M. KRAMER (*Rev. Agr. [Brazil]*, 16 (1941), No. 1-2, pp. 23-40, pls. 4).—An experimental study with suggested practical applications.

Weed suspects of the potato yellow dwarf virus, S. G. YOUNKIN (Cornell Univ.). (*Amer. Potato Jour.*, 19 (1942), No. 1, pp. 6-11).—The author reports 15 new weed suspects of this virus, together with limited evidence that the field oxeye daisy (*Chrysanthemum leucanthemum pinnatifidum*) may be a more important source of the virus in the field than medium red clover. The presence of the virus was demonstrated in spontaneously infected plants of *O. leucanthemum pinnatifidum*, *Rudbeckia hirta*, *Barbarea vulgaris*, and red clover.

The conidial phase of Sclerospora noblei, W. H. WESTON (*Phytopathology*, 32 (1942), No. 3, pp. 206-213, fig. 1).—The original characterization of *S. noblei* by the author on its distinctive resting-spore phase is supplemented by a description of its equally distinctive conidial stage. The well-developed, arbusculate conidiophores and the true conidia ally it with the predominantly conidial species of the Orient, whereas the size of the conidia (most commonly 25 μ -32.9 μ long), together with the relatively small oospores and dark, thick oogonial wall, are distinguishing characters. The species is compared with others, and such points of interest are noted as the regular occurrence of both reproductive phases on the same host, conidiophore development at night when the plants are wet with dew, and its apparent limitation to its indigenous Australian grass host (*Sorghum plumosum*).

The hot water treatment of sugarcane (Louisiana Sta. Bul. 336 (1942), pp. 27).—The following reports of progress are included: Introduction and Review of Investigations Concerning Hot Water Treatment of Sugarcane, by C. W. Edgerton (pp. 3-5); Effect of Hot Water Treatment on the Chlorotic Streak, by I. L. Forbes (pp. 5-7); Summary of Results Obtained in Small Plot Tests at the Sugar Station, Baton Rouge, by C. W. Edgerton, I. L. Forbes, and P. J. Mills (pp. 7-8); Relation of the Hot Water Treatment of Sugarcane to the Development of Red Rot, by I. L. Forbes (pp. 9-10); Biochemical Aspects of the Hot Water Treatment of Sugarcane, by J. Dufrenoy (pp. 10-11); and Report on Cooperative Tests With the Hot Water Treatment of Sugarcane, by W. J. Luke (pp. 12-27).

Gas treatment for the control of blue mold disease of tobacco, E. E. CLAYTON, J. G. GAINES, K. J. SHAW, T. E. SMITH, H. H. FOSTER, W. M. LUNN, and T. W. GRAHAM. (Coop. Ga. Coastal Plain, N. C., S. C., and Md. Expt. Stas. et al.). (*U. S. Dept. Agr., Tech. Bul. 799 (1942), pp. 38, figs. 7*).—In this study of downy mildew (*Peronospora tabacina*), covering a period of several years, control tests with benzol indicated that a vapor concentration of only 0.018 percent from 4:30 p. m. to 8 a. m. distinctly retarded its development and 0.097 percent gave complete control, but a maximum of 0.83 percent retarded growth. Thus the phytocidal level was about 8 times the fungicidal. In plant beds control was obtained with maximum measured benzol concentrations of 0.1–0.2 percent. Tests of other vapors showed xylol to be about 2.5 β -trichloroethane 5, and pentachloroethane about 15 times as effective as benzol, but with the last treatment plants were likely to wilt severely on exposure to bright sunlight.

Paradichlorobenzene gave effective control and has certain advantages over benzol; it is much more convenient to use but is less easy to vaporize properly. Its vaporization rate increased with decrease in crystal size until a diameter of about 0.93 mm. was reached. Still smaller particles tended to aggregate and were thus unsatisfactory. Vaporization was almost twice as rapid from crystals scattered over tobacco cloth or wire mesh as from those on a solid board surface. The rate may be four or five times greater from crystals scattered over tobacco cloth covering the entire bed than from those exposed in small wire baskets. Though vaporization is much affected by temperature, the effects can be partly compensated for by varying the size of crystals used and the method of distribution. Plant injury from paradichlorobenzene treatment resulted when conditions favored too rapid vaporization. The danger of such injury was reduced by suspending it 12–18 in. above the soil. The amount required for control depended to a large extent on the tightness of the cover, with those of varying tightness $\frac{1}{2}$ –3 lb. of vaporized paradichlorobenzene being required per 100 sq. yd. of bed. Soaking the muslin cover with water reduced the amount needed for disease control but increased the danger of plant injury. Two treatments per week are the minimum that can be depended on to give adequate control, and they must be continued as long as protection is desired.

Some leaf-curl diseases in South Africa.—I, Leaf-curl disease of tobacco; II, A new "petunia"-strain of leaf-curl and a note on the occurrence of a leaf-curl disease of hollyhock, A. P. D. McCLEAN (*Union So. Africa Dept. Agr. and Forestry, Sci. Bul. 225 (1940), pp. 70, pls. 14, figs. 3*).—Part 1 (pp. 5–60) of this study (21 references) considers the virus leaf curl transmitted by white fly to tobacco, *Datura stramonium*, tomato, currant tomato, *Nicotiana glutinosa*, *Nicandra physaloides*, and possibly also to *Physalis peruviana*, *Helichrysum monstrosum*, and *Zinnia elegans*. The disease was also transferred by grafting, but not mechanically and apparently not via the seed. The symptoms are described, and some preliminary observations are recorded on anatomical changes induced in the tobacco leaf. Part 2 (pp. 61–70) deals with a new form of leaf curl found spontaneously infecting petunia and transmitted by grafting to tobacco, *Nicotiana glutinosa*, tomato, and petunia. The virus was distinguished from the forms infecting tobacco leaf curl by its reactions in these hosts, the more important differences being its failure to induce a yellow network or any form of chlorosis in the early stages of infection in all its hosts, the continuous type of enation on tobacco leaves, the excessive distortion of the leaves, the well-marked enations on *N. glutinosa* and tomato, the development of petal-like outgrowths on the corolla tube of petunia, and its failure to infect *D. stramonium*. The occurrence of a leaf curl of hollyhock is also noted.

Derivatives of tobacco mosaic virus.—**I, Acetyl and phenylureido virus,** G. L. MILLER and W. M. STANLEY (*Jour. Biol. Chem.*, 141 (1941), No. 3, pp. 905-920, figs. 2).—Following up preliminary work on these virus derivatives (E. S. R., 85, p. 776), ultracentrifuge and electrophoretic measurements indicated a homogeneity comparable to that of the unaltered virus. Determinations of specific virus activity revealed that about 70 percent of the amino groups of the virus could be covered with either acetyl or phenylureido groups without significant inactivation of the virus, but further coverage was accompanied by loss of activity. From 20 to 40 percent and possibly more of the phenol plus indole groups also could be covered without inactivation. Primarily the phenol rather than the indole groups were affected in the above reactions. When samples of the derivatives were inoculated into Turkish tobacco plants and allowed to propagate, normal virus was formed. It is concluded that 70 percent of the amino groups and 20-40 percent of the phenol groups in the tobacco mosaic virus molecule are not important to the basic reactions of virus reproduction.

The chemical composition of strains of tobacco mosaic virus, W. M. STANLEY and C. A. KNIGHT (In *Cold Spring Harbor Symposia on Quantitative Biology*, IX. Cold Spring Harbor, N. Y.: Biol. Lab., 1941, vol. 9, pp. 255-260, pl. 1, fig. 1).—Similarities among the properties of virus and gene nucleoproteins are discussed, and it is concluded that examination of data on the chemical composition of variant strains of tobacco mosaic virus may have value in considering the nature of gene mutation. Analysis of 12 preparations of this virus indicated the presence of 3.8, 4.5, and 6 percent of tyrosine, tryptophan, and phenylalanine, respectively. Results for yellow aucuba, green aucuba, Holmes' masked, and J14D1 strains of tobacco mosaic viruses were the same as those for tobacco mosaic virus within experimental error, but pronounced differences were found for Holmes' ribgrass strain of tobacco mosaic virus and cucumber viruses 3 and 4, the tyrosine, tryptophan, and phenylalanine values for the former being 6.4, 3.5, and 4.3 percent, respectively, and about 3.8, 1.4, and 10.2 percent, respectively, for the cucumber viruses. Serological tests accorded fully with the chemical analysis results. The absence of significant quantitative differences in the nucleic acid component of the viruses was evident in the close agreement of the analytical values for P in the various strains. Qualitative tests showed the nucleic acid of all the viruses to be of the yeast type. The decided dissimilarities in the protein portions of three of the virus strains indicated that the mutation of tobacco mosaic virus to form a new strain may be accompanied by changes in the amino acid composition of the virus. On account of the nature of these changes it is suggested that the new virus strains arose by a diversion of the synthetic process by means of which the virus multiplies rather than by an alteration of completely formed virus molecules.

A possibilidade da transmissão de doenças de vírus pelas pulverizações com extratos de fumo [The possibility of transmitting virus disease by spraying extracts of tobacco], K. SILBERSCHMIDT and M. KRAMER (*Biologico*, 7 (1941), No. 8, pp. 207-215, figs. 3; *Eng. abs.*, p. 215).—In comparative spray tests on tobacco plants with nicotine sulfate, extracts of tobacco powders obtained with and without heating, and press sap of mosaicked tobacco plants, over 50 percent infection occurred in the last group, whereas in the others no more occurred than could be accounted for by accidental contamination. There appears to be little danger from sprays made from home-made extracts of tobacco powder.

Separation of tobacco necrosis virus and tobacco mosaic virus, S. S. COHEN (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 1, pp. 163-167, figs. 2).—From preparations of mixtures of (1) tobacco mosaic and (2) tobacco necrosis viruses obtained from plants with both diseases, the former was removed by isoelectric precipitation and by absorption with rabbit antiserum. The separa-

tion was followed by means of the analytical ultracentrifuge, the Tiselius electrophoresis apparatus, and the biological activities of the preparations.

Uma mela das sementeiras de fumo causada por *Rhizoctonia solani* Kuhn [Seedbed infection of tobacco by *R. solani*], A. S. COSTA (*Biologico*, 7 (1941), No. 11, pp. 323-324, figs. 2).—A note on seedling infection by the sore shin fungus.

Further studies on the use of fixed copper compounds for the control of vegetable diseases, J. D. WILSON. (Ohio Expt. Sta.). (*Ohio Veg. and Potato Growers Assoc. Proc.*, 26 (1941), pp. 20-33).—This is in the nature of a progress report (E. S. R., 84, p. 347) on the results with members of this group of fungicides, most of those now available in quantity falling in the three general classes of basic chlorides, basic sulfates, and oxides. Most of the work on vegetables has been on tomatoes, with the number of experiments considerably expanded during 1940 but including also tests on cucumbers, muskmelons, squashes, carrots, celery, etc. Comparisons are made on spray v. dust formulas, timing schedules, concentrations of Cu and of soybean v. wheat flour in sprays and dusts, differing rates of dust application per acre, day v. night applications, wetting agents, and different diluent materials (talc, clay from different sources, and finely ground gypsum and whiting).

The efficacy of certain nematocides in the control of onion bloat in muck soil, B. G. CHITWOOD and A. G. NEWHALL. (U. S. D. A. and Cornell Univ.). (*Phytopathology*, 32 (1942), No. 3, pp. 254-258).—After a dry season infested onions in the soil are the chief source of inoculum of *Ditylenchus dipsaci*, and infested onion tops also may harbor it slightly. Applied to the soil in the fall, S was of no significant value and heavy applications greatly reduced crop weights, but chloropicrin (2 cc. in holes 9 by 10½ in. apart) and a 1:9 mixture of chloropicrin and ethylene chloride (10 cc. in holes 9 by 10½ in. apart) both gave very highly significant reduction of onion bloat. It seems highly probable that at 10 cc. in holes 9 by 10½ in. apart ethylene chloride alone would give adequate control, as judged by the senior author's recent results (E. S. R., 86, p. 63) on soil infested with the murelssus strain. At this rate it would cost only \$110 per acre. Chloropicrin, alone or in mixture, sometimes reduced onion crop weights. It seems possible that it may have been adsorbed on the carboniferous muck soil. Perhaps the metal containers used in the tests contributed to its retention. Similar application in the field caused no crop reduction. No evidence of crop stimulation was noticeable from any treatment and the only adverse effects on growth were in the S and chloropicrin-treated plots. Field applications of S have also given consistent reductions in crop weights.

Effect of boron on growth and development of the radish, J. SKOK (*Bot. Gaz.*, 103 (1941), No. 2, pp. 280-294, figs. 5).—Boron-deficient radish produced small, light bluish green leaves, which were brittle and downward curled, and the thickened underground parts were light colored, narrow and elongated, and badly cracked. With B added up to 18 days after planting and then withheld, the tops made more growth but the brittleness and light color of the leaves persisted. The underground parts became larger and more normally shaped but were cracked. Under short photoperiod the B-deficiency symptoms were much less pronounced. The vascular tissue near the center of the axis was not affected by B deficiency, but normally developed vessels in the area between this and the outer cambium region were absent and the phloem in this region had disintegrated. If located near a crack, the cambium region had slightly developed vascular bundles, but if not near a crack it had well-developed bundles arranged in pronounced domes and circular areas. The splitting is said to be due to failure of normal vascular tissue development, coupled with differential growth pressures. There are 33 references.

Leaf-spot disease of cultivated salsify, M. B. LINN. (Cornell Univ.). (*Phytopathology*, 32 (1942), No. 2, pp. 150-157, figs. 2).—This apparently undescribed leaf spot, found due to *Stemphylium botryosom tragonogoni* n. var., occurs commonly in commercial plantings on Staten Island, N. Y. *Tragopogon pratensis*, a common weed, also proved susceptible. The most prominent symptoms are small, light-brown, necrotic spots causing affected leaves to yellow and wither. Under optimum temperature and humidity conditions, inoculation of the suspect results in the formation of lesions within 48-60 hr. The optimum temperature for growth and spore production in culture was 21°-27° C. There is some experimental evidence that commercial seed is not an important factor in overwintering and disseminating the pathogen. Soil-borne inoculum (old, blighted leaves from the previous crop) is believed largely responsible for the endemic occurrence of the disease. Biweekly applications of bordeaux mixture or Cuproclde 54 readily control the disease provided the spray program is begun before the older leaves bend over to the ground and a suitable spreader is used.

Measuring magnitude of a defoliation disease of tomatoes, J. G. HORSFALL and J. W. HEUBERGER. (N. Y. State and Conn. [New Haven] Expt. Stas. et al.). (*Phytopathology*, 32 (1942), No. 3, pp. 226-232, fig. 1).—Applying the McKinney rapid technic, each tomato plant is examined by walking crosswise of the plats and assigned an arbitrary number from 0 to 4, ranging from no disease to complete defoliation. The ratings are summed and divided by the total number of plants multiplied by 4, since 4 is the highest possible amount of disease. The quotient is multiplied by 100 to convert to percentage, which is called index of infection. This method was found to bear a linear relation to the (1) percentage of leaves killed by the fungus, (2) percentage of fruits invaded by stem-end rot, (3) weight of green plants less fruits at time of reading, and (4) weight of green fruits at the end of the season. Using this technic, three men read eight spray treatments and rated them in the same order of effectiveness. It thus follows that the method is valid, precise, and sufficiently objective. Although precise for reading a single series of fields or plats, it has the loophole that the standards are difficult to maintain precisely from season to season.

Varietal resistance to blossom-end rot in tomatoes, P. A. YOUNG. (Tex. Expt. Sta.). (*Phytopathology*, 32 (1942), No. 3, pp. 214-220, fig. 1).—Marglobe and Pritchard are said to be the commercial varieties strongly resistant to physiological blossom-end rot in eastern Texas, and tests indicated the least to occur in Blair Forcing, Break o' Day, Grothen Red Globe, Long Calyx Forcing, Marglobe, Marhio, Marvana, Marvel, Michigan State, Newport, Pritchard, Sureset Forcing, and "White-flowered" selections. Most other varieties tested proved moderately susceptible, and Riverside, Louisiana Red, and Buckeye State were extremely so. *Fusarium lycopersici* wilt had no apparent effect on resistance. An uncommon symptom of blossom-end rot consisted of uneven surfaces with brown areas on the fruit, indicating internal brown tissues.

Wilt resistance in F₁ hybrid watermelons, A. WELCH and I. E. MELHUS. (Iowa Expt. Sta.). (*Phytopathology*, 32 (1942), No. 2, pp. 181-182).—F₁ progenies from the following *Citrullus vulgaris* crosses proved 70-85 percent resistant to *Fusarium bulbigenum nivcum*: Wilt-susceptible Dixie Queen × wilt-resistant (Iowa Belle × Jugoslavia 7, backcrossed on Iowa Belle), wilt-resistant Japan 7 × wilt-susceptible Thurmond Grey, and wilt-resistant Japan 7 × wilt-susceptible Dixie Queen. These are the first cases known to the authors in which F₁ progenies of crosses between wilt-resistant and wilt-susceptible edible varieties of *C. vulgaris* have proved resistant to this pathogen, crosses of this type of resistance in the past appearing first in the F₁.

Control of cedar-apple rust on red cedar, R. P. MARSHALL. (U. S. D. A. et al.). (*Conn. Acad. Arts and Sci. Trans.*, 34 (1941), pp. 85-118, pls. 5, figs. 2).—

Among several materials tried, bordeaux mixture plus lead arsenate and a sticker and spreader proved superior to bordeaux alone, but bordeaux No. 180, devised by Keitt and Plimlter (E. S. R., 78, p. 354) for apple scab sanitation, was still more effective. The last-named has a high copper-lime ratio and contains arsenites. During 2 yr., a single treatment with bordeaux No. 180, applied thoroughly and heavily to cedars in early spring, has given satisfactory control of new gall production by *Gymnosporangium juniper-virginianae*, has inhibited development of sporidia by mature galls already present, and has not injured the host. These results are presented not as final conclusions but to stimulate further spray tests in various localities by other workers.

A physiological study of the susceptibility of the blushed and green sides of apples to certain fungous rots, K.-H. LIN (*Phytopathology*, 32 (1942), No. 3, pp. 239-245, fig. 1).—*Penicillium expansum* and *Sclerotinia fructicola* rotted the blushed side of fruits more slowly than the green side, whereas *Physalospora malorum* and *Lambertella corni-maris* exhibited no difference. The blushed side was found to be firmer and to contain higher contents of sugars and N and a lower content of moisture. The acid content of the two sides showed no consistent difference. The slower rate of rotting of the blushed side by *Penicillium expansum* and *S. fructicola* is correlated with the higher contents of sugars and N, a lower content of water, and greater firmness. As an explanation to account for the differences noted for *P. expansum* and *S. fructicola*, it is suggested that the firmer blushed side possibly contains more insoluble pectic substance and is thus more resistant to invasion by these fungi which are supposed to be intercellular and to penetrate through the cell wall of the susceptible by means of enzyme action.

Experiments on the inheritance of the "plus" and "minus" characters in *Glomerella cingulata*, J. O. ANDES. (Univ. Wis.). (*Bul. Torrey Bot. Club*, 68 (1941), No. 9, pp. 609-614, fig. 1).—Single-spore colonies of a Tennessee race of *G. cingulata* from a rotted apple were always either light or dark. Single-spore light clones gave ascii yielding all dark clones or half dark and half light, except for one perithectum in which the ascii yielded all dark or all light. Single-spore dark clones gave ascii yielding only dark clones. Ascii taken from perithecia produced where light and dark types met usually yielded all dark clones or half dark and half light, but several such ascii yielded dark and light clones in 3:1 or 1:3 ratios. In limited experiments with a northern race somewhat different results were obtained. Perhaps the most noteworthy aspect of the findings was the common production of all dark clones or half dark and half light from ascii originating in single-spore light lines of the southern race. Explanation of this remarkable phenomenon of continuous production of dark and light clones in 1:1 or 1:0 ratios from ascii of a homothallic haploid line must await further study.

Deficiency symptoms of apples and peaches, D. S. BROWN. (Univ. Ill.). (*Ill. Hort.*, 31 (1942), No. 1, pp. [3-4]).—Brief notes are presented on deficiencies in N, P, K, Ca, Mg, and B.

Host range and growth-temperature relations of *Coryneum beijerinckii*, C. O. and D. J. SMITH. (Calif. Citrus Expt. Sta.). (*Phytopathology*, 32 (1942), No. 3, pp. 221-225, figs. 3).—Infections resulted from leaf and stem inoculations in *Prunus alleghaniensis*, *P. angustifolia*, *P. armeniaca* and its variety *mandshurica*, *P. avium*, *P. besseyi*, *P. bokhariensis*, *P. caroliniana*, *P. cerasifera*, *P. davidiana*, *P. demissa* (= *P. virginiana demissa*), *P. domestica insititia* (= *P. insititia*), *P. fencliana*, *P. fremonti*, *P. hortulana*, *P. ilicifolia*, *P. kansuensis*, *P. lyoni*, *P. mahaleb*, *P. majestica*, *P. maritima*, *P. meaciana*, *P. mume*, *P. munsoniana*, *P. orthosepala*, *P. persica*, *P. pissardi*, *P. pseudocerasus*,

P. reverchoni, *P. salicina*, *P. scrotina*, *P. spinosa*, *P. texana*, *P. umbellata*, *P. watsoni* (= *P. angustifolia watsoni*), *P. yedoensis*, and other *Prunus* species. Lesions on stems from puncture wound inoculations developed on *P. armeniaca*, *P. kansuensis*, *P. persica*, *P. mahaleb*, *P. mira*, *P. munsoniana*, *P. salicina*, and *P. yedoensis*. Optimum development of the fungus in culture tests occurred at about 19° C. A few spores were produced at 8° and 13° and abundant sporulation occurred at 19° and 23°, but no spores were observed at 27° or higher.

Rapid transmission techniques for stone-fruit viruses, E. M. JILDEBRAND. (Cornell Univ.). (*Science*, 95 (1942), No. 2454, p. 52).—The present modified technic developed in studying the yellow-red virosis of peach involves insertion of infected buds about midway on the stems of rapidly growing seedlings 12-24 in. tall and cutting off the stem one node above the diseased bud 0-7 days afterwards to stimulate a new spurt of growth. This principle would seem almost universally applicable to studies of virus diseases of woody plants.

Ring spot of apricot, E. W. BODINE and W. A. KREUTZER. (Colo. Expt. Sta.). (*Phytopathology*, 32 (1942), No. 2, pp. 179-181, fig. 1).—This destructive apricot disease, characterized by irregular ring spots and blotches on both leaves and fruits, was observed in Colorado in 1935. In the following years it was found to be increasing on the Montgamet and Moorpark varieties, and inoculation tests later showed it to be due to a virus with the development of symptoms delayed for 2 yr.

Rosette mosaic of peach appears in the East, L. R. TELION (*Amer. Nurseryman*, 74 (1941), No. 6, p. 28).

Sobre uma doença de virus da bananeira [A virus disease of banana], K. SILBERSCHMIDT and N. R. NOBREGA (*Biologico*, 7 (1941), No. 8, pp. 216-219, pl. 1; *Eng. abs.*, p. 219).—This virus disease was transmitted by sap inoculation to several solanaceous plants, and various weeds in infected banana fields were shown to transmit the same or a very similar disease to these same solanaceous species. The virus seems to belong to the cucumber mosaic virus group.

Observations on the production of sexual organs in paired cultures of Phytophthora species of the palmivora group, D. MARUDARAJAN (*Indian Acad. Sci. Proc.*, 14 (1941), No. 4, Sect. B, pp. 384-389, pl. 1).—Studying oospore formation in paired cultures with various combinations of six isolates of *Phytophthora* spp., three were found to belong to *P. palmivora* and the others to *P. faberi*, *P. meadii*, and *P. arcaeae*, respectively. The last produced oospores with the other three species, and is said, therefore, to fall into the "rubber" group, whereas *P. meadii* is placed in the "cacao" group. Oospore formation in combinations of *P. arcaeae* with *P. meadii* or any one of the members of the cacao group lends additional support for merging all these isolates as strains of *P. palmivora*.

Brown rot of citrus fruit: Important factors in its control in orchard and packing house, L. J. KLOTZ. (Calif. Citrus Expt. Sta.). (*Calif. Citrog.*, 27 (1941), No. 1, pp. 6, 23, fig. 1).—The main factors are discussed.

Life activities and control of gummosis and brown rot fungus, L. J. KLOTZ. (Calif. Citrus Expt. Sta.). (*Citrus Leaves*, 21 (1941), No. 12, pp. 5, 9, figs. 3).—A note relative to *Phytophthora citrophthora* on citrus.

Um caso patológico perigoso nos cafeeiros do Amboim e Seles (Angola) [A dangerous coffee disease in Angola], J. COSTA ROSA (*Granja [Portugal]*, 1 (1940), No. 3, pp. 87-92).—The author calls attention to and discusses a serious pathological condition resulting in the sudden death of coffee trees. Although not new to this African region its cause is still unknown, and because of the importance of coffee culture there the need for more information on it is stressed.

Doenças do mamoeiro [Diseases of papaya], S. GONÇALVES-SILVA (Biologico, 7 (1941), No. 8, pp. 220-225, pl. 1).—Diseases due to *Asperisporium* (= *Pucciniopsis*) *caricae*, *Mycosphaerella caricae*, and *Oidium caricae*, mosaic, anthracnose, and various leaf spots are briefly considered.

Podridões da castanha do Pará [Rots of Brazil nuts], A. A. BITANCOURT (Biologico, 7 (1941), No. 11, pp. 303-312, fig. 1; Eng. abn., p. 312).—In rotted Brazil nuts (*Bertholletia excelsa*) examined immediately after harvesting, *Aspergillus* spp. were found in most cases, next in frequency was *Diplodia* sp., and other organisms isolated from rotted or rancid nuts were *Penicillium phoenicum*, *Rhizopus nigricans*, *Phomopsis* sp., *Cephalosporium bertholletianum*, *Colletotrichum gloeosporioides*, and various unidentified fungi and bacteria. Held for 5 mo. in a humid refrigerator, *Penicillium* sp. occurred in 55 of 62 rotted nuts, this result being attributed to the ability of the fungus to grow at the lower temperatures (5°-6.5° C.). Humidity was shown to be the most important factor in storing Brazil nuts. In well-ventilated rooms, even at fairly high temperatures, they kept well.

Cephalosporium leaf spot of Dieffenbachia, M. B. LINN. (Cornell Univ.). (Phytopathology, 32 (1942), No. 2, pp. 172-175, fig. 1).—The symptoms of a leaf spot of *D. picta*, found due to *C. dieffenbachiae* n. sp., are described. The initial infections occur on the young, convolute leaves. The pathogen enters more readily through wounds, most of which are believed to be made by mealybugs feeding under the sheaths surrounding the youngest leaves. Under experimental conditions, this pathogen and *C. cinnamomeum*, previously reported on *Nephtytis afzelii*, were not cross-inoculable. The cultural and morphological characteristics of the fungus are described in detail.

New diseases challenge gladiolus culture, A. W. DIMOCK. (Cornell Univ.). (Canad. Gladiolus Soc. Ann., 1941, pp. 60-64).—The author calls attention to three diseases which have recently threatened gladiolus culture, viz, *Fusarium* yellows, a blossom mottling or mosaic probably of virus origin, and a leaf blight possibly due to *Botrytis*.

Ascochyta majalis identified on lily of the valley in the United States, A. E. JENKINS. (U. S. D. A.). (Phytopathology, 32 (1942), No. 3, pp. 259-261, fig. 1).—The author reports *A. majalis* as causing a severe leaf spot on *Convallaria majalis* in Pennsylvania (1940), the first known record for the United States. Isolations of the fungus were made. Heretofore it has been known only from Italy and the Austrian Alps. In one case *Kabatiella microsticta* was also isolated from the Pennsylvania material, and only this fungus was found on leaf spots of lily-of-the-valley from Washington, D. C. It is suggested that the *Glocosporium* sp. to which a disease outbreak on lily-of-the-valley in Germany has been attributed may be this *Kabatiella*.

Prestorage disinfection of narcissus bulbs, F. WEISS, F. A. HAASIS, and C. E. WILLIAMSON (Phytopathology, 32 (1942), No. 3, pp. 199-205).—A marked reduction in basal rot (*Fusarium bulbigenum*) during the storage period was obtained by chemical treatments of the bulbs applied prior to the summer storage period. Among the various fungicidal materials tested, certain mercury compounds (particularly ethyl mercury chloride and phosphate) proved most effective, and a 2-min. immersion was equal to longer periods up to 10 min., in protecting against rot. Treatments applied sooner after harvesting more effectively prevented rot than did those applied later, and the protective effect was practically lost with delays of more than 2 weeks. When the treatments were given too soon after the bulbs were dug, both of the ethyl mercury compounds caused flower-bud injury, manifest in the production of crippled flowers. Such injury increased with duration of immersion and diminished with interval be-

tween digging and treating, becoming negligible after 2 weeks' delay. "A practicable compromise between the conflicting requirements of adequate protection against rot and minimization of flower injury is foreshadowed but has not definitely been reached."

Heat cure of aster yellows in periwinkles, L. O. KUNKEL (*Amer. Jour. Bot.*, 28 (1941), No. 9, pp. 761-769, figs. 2).—Infected periwinkles (*Vinca rosea*) were cured by treatments at 38°-42° C. for 2 weeks and also by immersion in a water bath at 40°-45° for a few hours. Cured plants were free of the virus. Longer treatments were required to inactivate the virus in plant stems than in aster leafhopper bodies, and it was more difficult to inactivate the virus in roots than in tops of potted plants. Periwinkles could be infected and cured as often as desired, and there was no evidence that cured plants were more resistant than those which had never had yellows. *Nicotiana rustica* plants with yellows were cured by 40° treatments for 3 weeks.

On the causal organism of a bacterial soft rot of poppy in Formosa [trans. title], T. MATSUMOTO and S. HIRANE (*Taihoku Imp. Univ., Phytopathol. Lab., Contribs.*, No. 57 (1941), pp. [1]+13, figs. 4; *Jap. text; Eng. abs.*, p. 13).—This organism and one isolated from radish are provisionally identified as *Bacillus* (= *Erwinia*) *aroidae*.

Relation of tube layers to age in sporophores of *Fomes igniarius* on aspen, R. R. HUNT and H. HOPP (*Phytopathology*, 32 (1942), No. 2, pp. 176-178, fig. 1).—Studying the development of 20 *F. igniarius* sporophores on *Populus tremuloides*, the age of 17 of them was found corresponding to the number of tube layers in the hymenophore. Three of the sporophores were almost or wholly enclosed by callus, remained small, and failed to develop a tube layer each year. It thus appears that the age of sporophores of the white heart rot fungus on aspen can usually be determined by the number of stratifications in the hymenophore.

Breeding work toward the development of a timber type of blight-resistant chestnut.—Report for 1940, A. H. GRAVES (*Bul. Torrey Bot. Club*, 68 (1941), No. 9, pp. 667-674, fig. 1).—This is a progress report (E. S. R., 84, p. 637), including data on the pollen and hybrids of 1940, cooperative plantings, and bud variation in *Castanea dentata*, with special reference to differences in blight resistance.

Sclerotium bataticola, a cause of damping-off in seedling conifers, S. H. DAVIS, JR. (*Science*, 95 (1942), No. 2455, p. 70).—A preliminary report.

Pyridoxine as a growth factor for *Graphium*, P. R. BURKHOLDER and I. McVEIGH (*Science*, 95 (1942), No. 2457, pp. 127-128).—This preliminary report on *G. ulmi* (= *Ceratostomella ulmi*) presents an example of the requirement of an accessory growth factor necessary to the life of a parasitic fungus. In view of recent work on chemotherapy by use of analogs competing with natural growth factors in certain pathogenic micro-organisms, it is hoped that this information may prove useful in attempts to control the Dutch elm disease. The fungus was able to grow in a basic medium supplemented only with pyridoxine.

Fungi causing decay of living oaks in the eastern United States and their cultural identification, R. W. DAVIDSON, W. A. CAMPBELL, and D. B. VAUGHN (*U. S. Dept. Agr., Tech. Bul.* 785 (1942), pp. 65, pls. 3, figs. 6).—*Stereum gausapatum* proved to be the most important species causing butt rot in young sprout oak stands in the Eastern States, and parent stumps were the main source of infection, but *Armillaria mellea*, *Fistulina hepatica*, and *S. frustulosum* were frequently encountered. From somewhat older stands in the Central and Eastern States, with parent stumps usually not a factor but fire wounds common, *S. frus-*

tulosum, *Hydnum erinaceus*, *Poria andersonii*, *P. cocos*, *Polyporus dryophilus*, *P. compactus*, and *P. sulphureus* were most commonly isolated. Trunk- or top-inhabiting species such as *Poria andersonii* and *Polyporus dryophilus* were important in the sampled areas of the Central States. *S. gausapatum* was of some importance as a top-inhabiting species in mature- or old-growth stands, but not as a butt-inhabiting species in stands lacking large persistent parent stumps. The oak heart rots in the southern delta region were mostly caused by species (listed and discussed) not commonly present in the other areas sampled.

Of the classified oak decay infections obtained from all sampled areas, 707 were by *S. gausapatum*, 135 by *S. frustulosum*, 115 by *H. erinaceus*, 96 by *A. mellea*, 71 by *F. hepatica*, 66 by *Poria andersonii*, 55 by *Polyporus compactus*, 51 by *P. dryophilus*, 45 by *Poria cocos*, 42 by *Polyporus sulphureus*, 29 by *Fomes gaeotropus*, 27 by *Corticium lividum*, 27 by *P. spraguei*, and 22 by *P. lucidus*, and 34 less prevalent species accounted for from 1 to 17 infections each. *F. everhartii*, *F. applanatus*, *F. robustus*, and *P. hispidus*, commonly fruiting on living trees, were seldom obtained from decay samples. *A. mellea* causes very little injury, and *F. hepatica* does not cause a pronounced decay, but most of the other more prevalent species are known to cause considerable damage. The fungi isolated showed very little tendency to host species preference, but *F. hepatica* was usually obtained from scarlet oak and *C. lividum* was confined in the South almost entirely to overcup oak. A key based on both macroscopic and microscopic characters in pure culture is provided as an aid to identification, and detailed descriptions of the cultural characteristics of each species are given to serve as a basis for the isolation method of decay diagnosis. There are 43 references.

Temperature, moisture, and penetration studies of wood-staining Ceratostomellae in relation to their control. R. M. LINDGREN (*U. S. Dept. Agr., Tech. Bul. 807 (1942), pp. 35, pls. 4, figs. 4*).—Eleven isolates of *Ceratostomella*, including 7 cultures of *C. pilifera* from different geographic regions, *C. coerulea* from Canada and Sweden, *C. pluriannulata*, and *C. ips*, showed significant differences in reaction to temperature on malt-agar. Though daily increments at a given temperature were not constant for any of the fungi, neither a definite periodicity in growth rate nor a determinable change in rate with time was indicated. There was a direct correlation between cardinal temperatures for growth on agar and viability of the isolates at unfavorably high temperatures, and loss of viability occurred relatively soon at temperatures only slightly above the maximum for growth.

The time of appearance of brown hyphae and the rate of change from hyaline to brown varied with the different isolates and temperatures, but brown hyphae appeared earliest at the most favorable growth temperatures and there were indications that hyphae of a given age changed from hyaline to brown more rapidly at such temperatures. Daily temperature changes between optimum and minimum for development had no effect on the growth-temperature relations of *C. pilifera* or *C. ips*, both becoming adjusted immediately to the new thermal environment. Hyphal penetration by *C. pilifera* into wood was most rapid at temperatures that likewise favored rapid mycelial growth on agar, and the rates of longitudinal penetration into wood and of radial growth on agar were also closely similar. Tests at different locations on and in lumber piles indicated that high temperatures are apparently not important in the practical problem of discoloration during air seasoning.

The minimum moisture content (oven-dry weight) for development of *C. pilifera* in *Pinus echinata* sapwood was about 24 percent, and after 10 days mature brown

hyphae were relatively abundant in wood above 29 percent, infrequent at 27-29, and absent below 27 percent moisture. Though free water in the wood did not appear essential for limited development, important staining is not considered likely in wood below the fiber saturation point. This species penetrated sapwood at about 0.5, 1, and 4.5 mm. daily in the tangential, radial, and longitudinal directions, respectively, and radial penetration was greater in steamed than in unsteamed wood. Under favorable growth conditions the hyphae penetrated into wood beyond the determined depth reached by control treatments within about 48 hr. Thus a delay of more than 1 day in applying treatments in practice is not considered advisable if control of *C. pilifera* is to be expected under all conditions. There are 22 references.

Biological decomposition of chemical lignin, I, II (*Canad. Jour. Res.*, 20 (1942), No. 1, Sect. C, pp. 1-27).—Two papers are presented:

I, *Sulphite waste liquor*, G. A. Adams and G. A. Ledingham (pp. 1-12).—The wood-staining fungus *Endoconidiophora adiposa* proved capable of decomposing about 10 percent of the lignin fraction of sulfite waste liquor as measured by the β -naphthylamine precipitation method, and also utilized 10-15 percent more of the reducing sugars than yeast. Provided the proper pH adjustment was attained, there was little difference in the effect of various neutralizing agents tested in the culture media. Compounds of P and N were the only supplementary nutrients required, and organic and ammonia N proved more satisfactory than inorganic nitrates for this fungus.

II, *Studies on the decomposition of calcium lignosulfonate by wood-destroying and soil fungi*, G. A. Ledingham and G. A. Adams (pp. 13-27).—Testing the growth and lignin-decomposing properties of 106 cultures of wood-destroying and soil fungi on a synthetic Ca lignosulfonate medium, certain species of *Fusarium* and *Alternaria*, decomposing a maximum of 12 and 18 percent, respectively, were the most effective in utilizing this lignin compound. Although a few wood destroyers were about equally effective, in general this group varied greatly and was more difficult to cultivate on the medium used. A slight direct correlation was noted between the Bavendamm tannic acid reaction for identifying lignin-decomposing fungi and the lignosulfonate break-down after 60 days' growth.

ECONOMIC ZOOLOGY—ENTOMOLOGY

[Work in economic zoology and entomology by the Missouri Station] (*Missouri Sta. Bul.* 438 (1941), pp. 51-55, 63, 69, 74, fig. 1).—Progress reports (E. S. R., 83, p. 217) of work by L. Haseman, L. Jenkins, C. W. Wingo, H. E. Brown, W. W. Smith, A. G. Peterson, L. S. Stadler, G. F. Sprague, L. Smith, E. R. Sears, J. G. O'Mara, H. G. Swartwout, E. M. Funk, and H. L. Kempster are given on codling moth and oriental fruit moth investigations, striped and spotted cucumber beetles, strawberry insects and their control, a study of insecticides, tolerance of the codling moth to the toxic action of insecticides, mosquitoes of Missouri, corn earworm studies, the periodical recurrence of insect pests, substitutes for arsenical sprays, artificial propagation of game birds, and the effect of feather mites on egg production.

[Work in economic zoology by the Cornell Station] ([*New York*] *Cornell Sta. Rpt.* 1941, pp. 102-103, 183-185).—The work of the year (E. S. R., 84, p. 781) reported relates to the nutritive requirements for growth, fur production, and reproduction in foxes and minks, by S. E. Smith, J. K. Loosli, R. Bernard, and A. Z. Hodson; nutritional requirements of trout, by C. M. McCay, A. V. Tunison, and A. M. Phillips; economics and biology of rodent pests in New York, with special reference to orchard mice, by W. J. Hamilton, Jr.; a study of the

economic importance and life history of game and forage fishes in New York, by E. C. Raney; and taxonomic and distribution studies of North American birds, by G. M. Sutton et al.

Wildfowl food plants, their value, propagation, and management, W. L. McATEE (*Ames, Iowa: Collegiate Press, Inc., 1939, pp. 1X+141, pls. 17, figs. 4*).—Information is given on the relative importance of waterfowl food plants in the conservation of wild ducks, geese, and swans, based upon a laboratory and field study in many States of the food of these birds begun by the U. S. D. A. Bureau of Biological Survey in 1905, together with a review of the literature. The several chapters consider (1) productivity, value, and utilization of wildfowl food plants (pp. 1-5), (2) wild duck food plants by families (pp. 6-69), (3) environmental limitations on the growth of aquatic plants (pp. 70-83), (4) planting suggestions (pp. 84-100), (5) construction of ponds (pp. 101-106), (6) control of undesirable plants and animals (pp. 107-111), and (7) vernacular names of wildfowl food plants (pp. 112-122). A list of 37 references to the literature cited and a copious index are included.

Game and wild-fur production and utilization on agricultural land, J. P. MILLER and B. B. POWELL (*U. S. Dept. Agr. Cir. 636 (1942), pp. 58, figs. 12*).—The past and present status of game and wild fur, value of game and wild fur, game and wild-fur production and use on agricultural lands, farm-game management programs, fur and game farms, and encouraging game and wild-fur production and utilization on agricultural lands are considered.

Winter reduction of small mammal populations and its probable significance, W. J. HAMILTON, JR. (Cornell Univ.). (*Amer. Nat.*, 76 (1942), No. 763, pp. 216-218, fig. 1).

Calcium intake and fluorine poisoning in rats, S. RANGANATHAN (*Indian Jour. Med. Res.*, 29 (1941), No. 4, pp. 693-697).—Calcium, administered either as a salt or when present in combination in natural foodstuffs, was found to exert a mitigating influence on fluorine poisoning in rats. At the levels of dosage used the toxic effect of fluorine was inversely proportional to calcium intake.

The ecology and economics of the birds along the northern boundary of New York State, A. S. HYDE (*Roosevelt Wildlife Bul. [Syracuse Univ.]*, 7 (1939), No. 2, pp. [1]+62-215, pl. 1, figs. 32).—This report of work conducted is presented with a list of 47 references to the literature cited.

Spring flight of the diving ducks through northwestern Iowa, J. B. LOW. (Iowa Expt. Sta.). (*Condor*, 43 (1941), No. 3, pp. 142-151, figs. 7).

New parasite records from the ruffed grouse, N. ISHIL (Univ. Minn.). (*Jour. Parasitol.*, 28 (1942), No. 1, p. 92).—Record is made of the collection in Minnesota of two trematodes of the species *Lycerosomum monenteron* from the liver of the ruffed grouse (*Bonasa umbellus*) and one of *Echinoparyphium aconiatum* from the intestine.

Five new species of avian schistosomes from Wisconsin and Michigan, with the life cycle of *Gigantobilharzia gyrauli* (Brackett, 1940), S. BRACKETT. (Univ. Wis., Univ. N. C., et al.). (*Jour. Parasitol.*, 28 (1942), No. 1, pp. 25-42, figs. 9).—Report is made of the results of the examination of birds made in the spring and summer of 1940 in Wisconsin and Michigan, during which time five previously undescribed schistosomes were found and are here described as new.

Check list and bibliography of North American earthworms, G. E. GATES (*Amer. Midland Nat.*, 27 (1942), No. 1, pp. 86-108).

Insecticidal and piscicidal plants of India, R. N. CHOPRA, R. L. BADHWAR, and S. L. NAYAR (*Jour. Bombay Nat. Hist. Soc.*, 42 (1941), No. 4, pp. 854-902).

A survey of plant products for insecticidal properties, A. HARTZELL and F. WILCOXON (*Contrib. Boyce Thompson Inst.*, 12 (1941), No. 2, pp. 127-141, fig. 1).—Tests were made of the products of 150 species and varieties of plants as possible insecticides. "Of this number, water and acetone extracts of 36 species gave kills of 50 to 100 percent to mosquito larvae (*Culex quinquefasciatus*). Products of the following 18 botanical drugs gave kills of 90 to 100 percent: Balm of Gilead buds, caraway seed, echinacea root [*Brauneria* sp.], elecampane root [*Inula helenium*], hydrangea root, male fern rhizome, black mustard seed, pepo (pumpkin seed), sage root, oil of bay leaves, oil of cubebs, oil of cypress, oil of patchouli, oil of rosemary, oil of santal, oil of sweet basil, oil of sweet marjoram, and oil of wormseed or chenopodium. In addition, a steam distillate of elecampane gave an average kill of 89 percent to *Aphis rumicis*. Of the 18 plant products giving the highest kill to mosquito larvae, all are botanical drugs, although many species not listed as drug plants were tested. It is of interest to note that among the drug plants giving high kills to mosquito larvae are several well known anthelmintics. No correlation was found to exist between insect resistance to plants and toxicity of leaf extracts to mosquito larvae. Of 11 varieties of castor bean tested on grasshopper (*Mcianoplus differentialis*), the foliage of none was found to be sufficiently toxic to be satisfactory as a practical insecticide. Preparations of ricin, ricinin, and crushed castor bean seeds, each incorporated in bran mash baits and fed to grasshoppers, also showed no toxicity." It is pointed out that the extracts that will kill tropical fish will not necessarily give an appreciable kill to mosquito larvae.

A list of 35 references to the literature cited is included.

A study of antidotes for fluorine, S. MARCOVITCH and W. W. STANLEY. (Tenn. Expt. Sta.). (*Jour. Pharmacol. and Expt. Ther.*, 74 (1942), No. 2, pp. 235-238).—In testing sodium fluoborate (NaBF_4) as an insecticide it was found to be nontoxic to insects when fed in powdered form although containing 68 percent soluble fluorine, and rats upon which the powder was tested made normal gains in weight. In solution, however, enough fluorine is liberated to produce toxic effects. It is shown that both aluminum sulfate and hydrated lime are capable of saving animals from a lethal dose of sodium fluoride when mixed with the latter. Boric acid also has some value as an antidote through the formation of a fluoborate. The aluminum sulfate forms cryolite which was found to be much less toxic. When aluminum sulfate is mixed with the sodium fluoride and used as a roach powder a lower kill is obtained than with sodium fluoride alone.

Review of United States patents relating to pest control, [January-December 1941], R. C. ROARK (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., Rev. U. S. Pat. Relat. Pest Control*, 14 (1941), Nos. 1, pp. 8; 2, pp. 7; 3, pp. 8; 4, pp. 13; 5, pp. 9; 6, pp. 11; 7, pp. 13; 8, pp. 8; 9, pp. 10; 10, pp. 9; 11, pp. 10; 12, pp. 11).—A continuation of this series (*E. S. R.*, 85, p. 219).

A laboratory spraying apparatus and technique for investigating the action of contact insecticides, with some notes on suitable test insects, C. POTTER (*Ann. Appl. Biol.*, 28 (1941), No. 2, pp. 142-169, pl. 1, figs. 5).

Advances in entomology, C. H. RICHARDSON. (Iowa Expt. Sta.). (*Chem. and Engin. News*, 20 (1942), No. 4, pp. 241-256, figs. 16).—A review, presented with a list of 267 references to the literature cited.

Report of the Chief of the Bureau of Entomology and Plant Quarantine, L. A. STRONG and A. S. HORT. (Coop. expt. stas. et al.). (*U. S. Dept. Agr., Bur. Ent. and Plant Quar. Rpt.*, 1941, pp. 120).—The work of the year (*E. S. R.*, 84, p. 783) with fruit and nut insects included codling moth control with insecti-

cides and light traps, investigations with Comstock's mealybug and the introduced scale *Parlatoria chinensis* (Marl.), parasites of the oriental fruit moth, use of ethylene dichloride for peach borer control and dichloroethyl ether for plum curculio control, collection of phony peach disease vectors, investigations of vectors of peach mosaic and "X" disease of peaches, insecticides for grape berry moth, control of the hickory shuckworm on pecan, studies on the biology of the filbert worm *Melissopus latiferreanus* (Wlsm.), control of the saw-toothed grain beetle in stored raisins, studies on citrus rust mite in Florida, cyanide fumigation improvements and cube resins in oil for California red scale control, insecticides for citrus thrips control, studies on the Japanese beetle, notes on the pear psylla in the Northwest and Hall's scale in California, and control of the Mexican fruitfly and the Mediterranean fruitfly.

Work with insects affecting forest and shade trees mentioned includes protection of buildings against termite damage, control of powder post beetles, control of pine bark beetles by sanitation-salvage logging, bark beetle surveys and control, completion of hazard inventory in California, elm bark beetles trapped in chemically treated trees, effectiveness of concentrated spray against the white-pine weevil, study of the hemlock borer, study of plantation insects in the Lake States, locust borer attack on sprout growth of black locust, a disease of the European spruce sawfly, insect vectors of the phloem necrosis disease of elm, and control of gypsy and brown-tail moths.

Cereal and forage insect investigations included biology and control of the corn earworm, European corn borer, grasshoppers, Mormon cricket, white-fringed beetle, legume weevil *Hypera brunneipennis* (Boh.), alfalfa weevil, distribution and food plants of May beetles and white grubs, control methods for insects attacking stored grains and cereals, production of varieties of wheat resistant to the hessian fly, mineral oil emulsions for chinch bug control, work with pale western and army cutworms, a leafhopper (*Draculacephala portola* Ball) a vector of chlorotic streak of sugarcane, cryolite for sugarcane borer control, influence of burning on sugarcane borer survival, and eradication of the West Indian sugarcane mite *Tarsonemus bancrofti* Michael.

Truck crop and garden insect investigations reported included work on the pea weevil, raspberry fruitworm, red berry mite *Eriophyes essigi* Hassan, natural enemies of the European earwig, potato psyllid, potato and western potato flea beetles, potato aphids, biological control of wireworms, ecology and control of the beet leafhopper, influence of *Lygus pratensis oblineatus* (Say) and *L. hesperus* Knight on sugar beet seed production and their control, control of red spiders and thrips on greenhouse cucumbers, cyclamen mite, aster leafhopper, insect vectors of mosaic disease of lilies, gladiolus thrips, bulb flies, mushroom flies and mites, tobacco hornworm control, green June beetle larvae in tobacco seedbeds, tobacco moth and cigarette beetle control, sweet-potato weevil control and eradication, and mole cricket control.

Work with cotton insects included biology and control of the bollweevil, cotton flea hopper, leaf and root aphids, hemipterous insects (*Lygus*, *Chlorochroa*, and *Euschistus* spp., etc.), bollworm, pink bollworm, particle size of insecticides for cotton insects, and thurberia weevil control.

Bee culture work dealt with American foulbrood resistance studies, nosema disease, influence of grasshopper baits on honeybees, effect of sunlight on bee eggs and larvae, pollen reserves, selection of bees for increased honey production, breeding a strain of Italian bees of distinctive color, artificial insemination studies, chemical analyses of and feeding experiments with pollen, sugar concentration in nectars of different plants, nectar investigations, and collection of alfalfa pollen by bees.

Investigations on insects affecting man and animals included work with mosquitoes, sand flies, ticks affecting man, the Clear Lake gnat, secretions of insects, screwworms, cattle grubs, fly sprays, ticks affecting animals, hornfly, cattle lice, and dog flies.

Mention is also made of insect identification work, foreign parasite introduction, testing insecticides and fumigants, physiology of insects, application of insecticides, and analytical work. Inspection and quarantine work is summarized. Plant disease studies are noted on page 63 and insecticide investigations on page 5.

[Contributions on economic entomology] (6. *Pacific Sci. Cong., Calif., 1939, Proc., vol. 4, pp. 255-303, 317-367, 373-458, 463-497, figs. 21*).—Among the contributions presented at Berkeley, Palo Alto, and San Francisco from July 24 to August 12, 1939, are the following: The Origin and Distribution of the Coleopterous Insect Fauna of North America, by E. C. Van Dyke (pp. 255-268); The Origin and Distribution of the Cerambycidae of North America, With Special Reference to the Fauna of the Pacific Slope, by E. G. Linsley (pp. 269-282); The Insects of the Californian Islands, by T. D. A. Cockerell (pp. 283-295); The Distributional History of North American Bees, by C. D. Michener (pp. 297-303); Distribution of Lepidoptera in Pacific Island Groups, by O. H. Swezey (pp. 317-324); The Colonization of Imported Parasites of the European Corn Borer in the United States, by W. A. Baker and W. G. Bradley (pp. 325-333); The Collection of Parasites of the Sugar-Cane Borer (*Diatraea saccharalis*) in Sao Paulo, Brazil (pp. 335-338) and The Collection in Trinidad and Southern Brazil of Coccinellids Predatory on Bamboo Scales (pp. 339-343), both by K. A. Bartlett; An Account of the Reduction of the Immigrant Taro Leaf-Hopper *Megamelus proserpina* Population to Insignificant Numbers by the Introduction and Establishment of the Egg-Sucking Bug *Cyrtorhinus fulvus*, by D. T. Fullaway (pp. 345-346); The Introduction From Brazil and Establishment in Puerto Rico of *Larva americana* Saussure, by G. N. Wolcott (pp. 347-350) Introduccion de hiperparasitos en Chile: Resumen de las importaciones hechas y de sus resultados [Introduction of Important Parasites of Insects in Chile: Review of the Importations and Their Results], by A. G. Marin and R. C. Peña (pp. 351-357); Recent Developments in Biological Control of *Diatraea saccharalis* in the Continental United States, by J. W. Ingram, E. E. Holloway, and J. W. Wilson (pp. 359-363); The Problems of Biological Control in Japan, by T. Ishii (pp. 365-367); The Practical Application of Biological Studies on Parasites Employed in Biological Control, by S. F. Flanders (pp. 373-381); A Survey of Philippine Entomology, With Special Reference to Applied or Economic Work, by F. Q. Otanes (pp. 383-396); Eriophyid Mites, Especially Imported Species, in California, by H. H. Kelfer (pp. 397-401); The Value of Accurate Classification of Insects as Illustrated by the Confusion of Two Closely Related Species of *Hypera*, by A. E. Michelbacher (pp. 403-405); A Preliminary Report on the Entomological Survey of the Micronesian Islands Under the Japanese Mandate, With Special Reference to the Insects of Economic Importance, by T. Esaki (pp. 407-415); Laboratory Propagation of Parasites and Its Place in Biological Control Programs, by A. B. Balrd (pp. 417-420); Some Factors Relating to Colonization, Recovery, and Establishment of Insect Parasites, by C. P. Clausen (pp. 421-428); Some Entomological Problems of the Pacific Area With Which Medical Entomologists Should Be Concerned, by W. B. Herms (pp. 429-432); Present Knowledge of the Status of Vectors of Sylvatic Plague in North America, by M. A. Stewart (pp. 433-437); The Ecology of *Dermacentor albipictus* (Packard), by D. E. Howell (pp. 439-458); The *Anopheles* Complex in California (Diptera: Culicidae), by T. H. G. Aitken (pp.

463-486); and Knowledge of the Internal Anatomy of *Dermacentor andersoni* Necessary to Pursue the Study of Rickettsial Infections in the Tick, by J. R. Douglas (pp. 487-497).

[Entomological investigations by the Cornell Station] ([*New York*] *Cornell Sta. Rpt. 1941*, pp. 127-136).—A progress report (E. S. R., 84, p. 786) noting work on white grubs and other forage crop insects, by H. H. Schwardt, C. G. Lincoln, T. W. Kerr, Jr., and W. D. Wylie; the Mexican bean beetle and its control on field beans, by Schwardt and M. Ramsay; biology and control of the seed corn maggot, by Schwardt; the alfalfa snout beetle, by Schwardt, Lincoln, and L. D. Newsom; biology and control of the clover root borer, by Lincoln; biology and control of cutworms, by C. E. Palm and Wylie; the Dutch elm disease, by D. L. Collins, D. Connola, and L. E. Hagmann; studies on onion thrips and control of lettuce yellows through control of the aster leafhopper, both by T. C. Watkins and W. H. Ewart; wireworms and their injuries to potatoes, by W. A. Rawlins and R. E. Olson; millipedes and scab gnats in relation to tuber defects, by Rawlins, Lincoln, and K. B. Nash; insects attacking potatoes on Long Island, by Rawlins, Watkins, and J. O. Nottingham; potato rotation studies, by Rawlins and Nash; quantitative studies of the effects of insect attacks on potato plants, by Rawlins and W. E. Curtis; spraying and dusting practices in protecting potatoes against insect attack in up-State New York, by Rawlins and R. Staples; dermestid larvae injurious in dwelling houses, by G. H. Griswold; nonpoisonous sprays, mainly nicotine compounds, by T. R. Hansberry and L. B. Norton; and sulfur and sulfur compounds in relation to the control of insect pests, by Hansberry, Palm, and G. E. Carman.

Proceedings of the Entomological Society of British Columbia (*Ent. Soc. Brit. Columbia, Proc.*, No. 33 (1942), pp. 36, figs. 3).—Contributions presented (E. S. R., 86, p. 353) include: Host Poisoning by *Ixodes californicus* Banks (Acarina: Ixodidae) (pp. 5-6) and Host Immunity to Ticks (Acarina) (pp. 12-13), both by J. D. Gregson; A Simple Method of Adding or Changing Preservative Liquids in Sealed Vials Without Removing the Corks, by E. R. Buckell (pp. 6-8); The Occurrence of the Clay-Coloured Weevil *Brachyrhinus singularis* (L.) in British Columbia (Coleoptera), by H. Andison (pp. 8-10); Two Unusual Larval Habitats of Tabanids (Diptera) (pp. 10-12) and A Preliminary List of the Neuroptera of British Columbia (pp. 23-28), both by G. J. Spencer; A List of Nineteen Species of Asilidae Collected at Robson, B. C. (Diptera), by H. R. Foxlee (p. 14); A Note on the Use of Mechanical Bait Spreaders for Grasshopper Control in British Columbia, by I. J. Ward (pp. 14-18); Some Food Plants of Lepidopterous Larvae—List No. 8, by J. R. J. Llewellyn Jones (pp. 18-19); and Insects Active Throughout the Winter at Vancouver, B.C.—Part I, Introduction and Lists of the Coleoptera and Neuroptera, by R. E. Foster (pp. 19-23).

Entomology (Philippine Bur. Plant Indus. Semiann. Rpt., Jan. 1-June 30, 1939, pp. 69-73, pls. 3).—Work with crop pests during the first 6 mo. of 1939 is reported.

Types vs. types, C. W. SABROSKY. (Mich. Expt. Sta.). (*Ent. News*, 53 (1942), No. 1, pp. 7-9).

The temperature preferendum of certain insects, J. DEAL (*Jour. Anim. Ecol.*, 10 (1941), No. 2, pp. 323-356, pl. 1, figs. 10).—In a contribution from the Rothamsted Experimental Station, a description is given of three different types of apparatus that were experimented with before a linear brass gradient which gave a range of temperature from 10° to 35° C. in a straight-line gradient was selected. "This allowed the insects a choice of about 1° in every 4 cm. The relative humidity in such an apparatus varied inversely with

the temperature except where food was used, when it remained practically uniform. The temperature preferendum was tested of 23 species of insects from 6 orders. Insects were chosen to represent different environments or habitats, such as the following: Stored product insects, leaf-feeding insects, plant-sucking insects, human parasites, insect parasites, and soil insects. Results are based on experiments each carried out for not less than 3 days. In every case a control was also run for 1 day to get the random distribution of the insects. At the cold end of the gradient the metabolic activities of the insects were slowed down to such an extent that many species were trapped there, thus giving an apparent preference for the colder end. As a result when insects went to a warmer zone it was considered more significant than when they went to a cold zone. The flour beetle (*Tribolium confusum*) when kept at 27° had a lower preferred temperature than when kept at room temperature. Wireworms kept at 5° for a fortnight gave no different reaction from those kept at room temperature. Insects that were given food in the gradient had a narrower preference zone than when not given food. In general the preferences of the immature forms tended to coincide with those of the adults of the same species. With sawflies (*Pteronidea melanaspis*) the males tended to have a wider temperature range than did the females. The braconid parasites (*Apanteles congestus*) went to a lower temperature on each successive day they were in the gradient, and at the end of 3 days were alive and quite active. At the same time a surplus stock kept at room temperature were all dead at the end of 1.5 days. Generally speaking, all the insects experimented with have shown a definite temperature preference but the preference has been for a fairly wide range of temperature and not a point as has been suggested by some workers."

A list is given of 47 references to the literature.

California cotton insects, G. L. SMITH (*California Sta. Bul.* 660 (1942), pp. 50, figs. 35).—This contains biological and control information on 28 insects deemed important in California, 6 insects of little or no importance in California, and 6 beneficial insects commonly found on cotton in the San Joaquin Valley.

Rice-field insects, W. A. DOUGLAS and J. W. INGRAM. (Coop. La. Expt. Sta.). (*U. S. Dept. Agr. Cir.* 632 (1942), pp. 32, pl. 1, figs. 21).—The rice stinkbug *Solubea pugnax* (F.), sugarcane borer, rice stalk borer, and the sugarcane beetle are the four major pests of rice in the Southern States. The rice stinkbug sucks the developing rice grain, early injury causing blank grains and later injury causing distorted or discolored kernels. Burning or plowing under heavy grasses decreases the number of overwintering stinkbugs. Sugarcane borer and rice stalk borer larvae feed within the rice stalk, causing death of the developing panicle, a decrease in growth and development of the affected plants, the breaking off of injured panicles, and lodging of injured stems. Burning, pasturing, or plowing rice stubble fields in winter decreases the number of overwintering borers. Dragging and submerging stubble fields in winter has resulted in a complete mortality of borers. Adult sugarcane beetles gnaw young rice plants previous to spring flooding, and later newly emerged adults attack maturing stalks when the field is drained preparatory to harvesting. Irrigation water drives the beetles from the field. Delayed drainage or immediate reflooding following the appearance of beetles prior to harvest decreases losses. The elimination of sod land which serves as breeding areas is a useful practice. Other insects cause slight or rarely severe damage to rice. Serious insect injury has not been noted in California rice fields.

Insects of the blackberry, raspberry, strawberry, currant, and gooseberry. A. J. HANSON and R. L. WEBSTER (*Washington Sta. Pop. Bul.* 164 (1941), pp. 40, figs. 27).—This account, which is a revision of Popular Bulletin 155 (E. S. R., 80, p. 226), summarizes the life histories of and control practices for two additional pests.

Annotated list of elm insects in the United States. C. H. HOFFMAN (*U. S. Dept. Agr., Misc. Pub.* 466 (1942), pp. 20).—This annotated list is based on literature records and information from files of the Bureau of Entomology and Plant Quarantine. It includes only species thought to be closely associated with elm. A list is given of 634 species representing 126 families and 12 orders.

Technique for artificially feeding *Scolytus multistriatus* and *Saperda tridentata* spores of *Ceratostomella ulmi* and other substances. W. D. BUCHANAN and C. MAY. (U. S. D. A.). (*Phytopathology*, 32 (1942), No. 1, pp. 95-97, fig. 1).

A study of some mixed fumigants suitable for the control of stored products insects. M. SHAFIK (*Egypt Min. Agr., Tech. and Sci. Serv. Bul.* 227 (1938), pp. [3]+160, pls. 67).—Included in the introduction to this contribution is a list of 27 insects found in Egypt causing damage in warehouses, factories, and mills and on docks, etc., with the products attacked and a note on the breeding of the Mediterranean flour moth. The results of an investigation of the saturation partial pressures of the constituents of binary mixtures of certain fumigants (pp. 11-76) are followed by determinations of inflammability of mixtures (pp. 77-87) and of the relative toxicity of the mixed fumigants to the Mediterranean flour moth (pp. 88-141), the details of which are given in tables and graphs. The toxicity tests were made at a temperature of 25° C. and humidity of 80 percent with an exposure of 21 hr. It was found that all the esters, whether pure or not and whether chlorinated or not, appear to be particularly toxic to eggs and adults and less toxic to larvae and pupae. The same is true for carbon tetrachloride and trichloroethylene. Carbon disulfide is relatively nontoxic to eggs. Ethylene dichloride, whether mixed with carbon tetrachloride or with trichloroethylene, is particularly toxic to larvae. Based upon these tests, the order of toxicity of the fumigants, together with the minimum dose for 100-percent kill in cubic centimeters per liter is: Isopropyl chloroacetate 0.008, methyl chloroacetate 0.01, ethyl chloroacetate 0.02, ethylene dichloride-carbon tetrachloride 0.05, ethylene dichloride-trichloroethylene 0.08, ethyl formate-carbon tetrachloride 0.10, carbon disulfide-carbon tetrachloride 0.14, ethyl acetate-carbon tetrachloride 0.18, ethyl acetate-trichloroethylene 0.18, carbon tetrachloride 0.18, and trichloroethylene 0.18.

"As regards the suitability of these fumigants for practical use, the chloroacetates are rather dear and difficultly volatile. Their lachrymatory effect is also a slight draw-back. The ethyl acetate mixtures and the pure compounds carbon tetrachloride and trichloroethylene are rather feebly toxic. Carbon disulfide has to be mixed with such a high percentage of carbon tetrachloride in order to obtain noninflammability that the mixture is not very toxic, particularly to eggs. The ethyl formate-carbon tetrachloride mixture is fairly toxic and should be reasonably cheap since it contains only 12 percent ethyl formate by volume. Both the mixtures containing ethylene dichloride are highly toxic and fairly cheap. The mixture with trichloroethylene has the advantage of evaporating unchanged. Ethylene dichloride alone is difficultly inflammable." It is pointed out that all of these fumigants are fat solvents and are unsuitable for fumigating highly fatty goods. The ethylene dichloride mixtures are particularly suitable for fumigating material with a high water content or for use in places where free water cannot be excluded.

This work is considered to be the first published attempt to put the use of mixed noninflammable fumigants on a scientific basis. An annotated list of 19 pages of references to the literature is included.

The possible dangers of transmission of disease by airplane, W. P. JACKSON (*U. S. Naval Med. Bul.*, 40 (1942), No. 1, pp. 115-125).—The importance of the airplane in the spread of live insects, including some vectors of dangerous diseases, is emphasized. This danger is more apparent now that there are known to be vectors of yellow fever and malaria other than the yellow-fever and common malaria mosquitoes.

A "delousing leg band" for chickens, C. M. HAMILTON. (West. Wash. Expt. Sta.). (*Vet. Med.*, 37 (1942), No. 4, p. 178).—Tests have shown that a medicated leg band containing nicotine sulfate 14.4 percent, naphthalene 21, and oil of tar 12 percent, together with inactive ingredients amounting to 52.6 percent, is ineffective in killing and repelling lice and mites when used on chickens in open pens.

Reactions of man to the feeding of reduviid bugs, S. F. WOOD (*Jour. Parasitol.*, 28 (1942), No. 1, pp. 43-49).—Tests made of the feeding reactions of several species of uninfected reduviid bugs of the genus *Triatoma* and one of *Paratriatoma* are presented. No marked physical discomfort was experienced during feeding of *T. protracta* (Uhl.), *T. protracta woodi* Usinger, *T. longipes* Barber, *T. heidmanni* Neiva, *T. gerstaeckeri* (Stål), *T. sanguisuga* Lec., *T. rubida* (Uhl.), and *P. hirsuta* Barber at different times upon various areas of the fingers, hand, and forearm. In every case but one there was no marked injury due to the bite. In the case of *P. hirsuta* there was a local irritation of the skin at the site of the bites, but there was no general reaction of any kind.

Transmission of chlorotic streak of sugar cane by the leaf hopper *Draculacephala portola*, E. V. ABBOTT and J. W. INGRAM. (U. S. D. A.). (*Phytopathology*, 32 (1942), No. 1, pp. 99-100).—Experiments conducted in Louisiana, while of a preliminary nature, offer proof of the transmission of chlorotic streak of sugarcane, first differentiated in Java in 1928, by *D. portola*, a leafhopper usually more abundant than the total of all other sucking insects on sugarcane, excluding mealybugs, in that State.

The corn lanternfly in New Jersey (Homopt.: Fulgoridae), G. W. BARBER and B. B. PEPPER. (U. S. D. A. and N. J. Expt. Stas.). (*Ent. News*, 53 (1942), No. 1, p. 22).—The presence of *Peregrinus maidis* (Ashm.) in New Jersey during the summer of 1939, where by late fall populations of considerable size were observed in late sweet corn (Golden Cross Bantam), although no serious injury was found, and its occurrence in a single locality in 1940 are noted.

Biology and control of woolly [apple] aphid (*Eriosoma lanigerum* Hausm.) (Aphididae: Rhynchotha) in the Punjab, KHAN A. RAHMAN and ABDUL WAHID KHAN (*Indian Jour. Agr. Sci.*, 11 (1941), No. 2, pp. 265-278, figs. 5).

The over-wintering of *Myzus persicae* Sulz. on Brassicae in North Wales, F. H. JACOB (*Ann. Appl. Biol.*, 28 (1941), No. 2, pp. 119-124).—In the field observations reported no evidence was obtained that the green peach aphid oviposits on winter Brassicae. In 1938-39 considerable numbers of this aphid overwintered on such hosts both under field and garden conditions, savoy cabbage being the preferred host plant. Failure to find the green peach aphid in any situation following the hard frost in January 1940 indicates that due to unfavorable conditions which may be met with in North Wales in some seasons it fails to overwinter out of doors. In North Wales the peach is probably of minor importance as a winter host, but glasshouses form a reservoir from which numerous green peach aphids may migrate in spring and early summer. Detailed studies of populations of this aphid on potato crops in North Wales indicate that

years of high infestations follow winters when widespread hibernation on Brassicae has occurred. Conversely, years of low infestation on potato follow years when few or no green peach aphids overwinter on winter Brassicae.

Physiological relationships between insects and their host plants.—II, A preliminary study of the effects of aphides on the chemical composition of cabbage and field beans, A. C. EVANS (*Ann. Appl. Biol.*, 28 (1941), No. 4, pp. 368–371, figs. 2).—Contributing further from the Rothamsted Experimental Station (E. S. R., 80, p. 655), report is made of observations in which the infestation of cabbage by the cabbage aphid caused a marked decrease in the amount of carbohydrate synthesized but smaller decreases in fat, crude protein, and other constituents. Infestation of field beans by *Aphis fabae* Scop. did not have any great effect on the chemical composition of the crop.

A virosis-like injury of snapdragon caused by feeding of the peach aphid, K. F. BAKER and C. M. TOMPKINS. (Univ. Calif.). (*Phytopathology*, 32 (1942), No. 1, pp. 93–95, fig. 1).—An injury to snapdragon seedlings and cuttings grown for experimental purposes under glass at Los Angeles, which commonly showed an injury of the terminal growth resembling a virosis, and later observed on *Antirrhinum* plants grown under glass and in protected places in the San Francisco Bay area, was found to be caused by the feeding of the green peach aphid and probably resulted from some toxic secretion of the insect. Thus far the injury has been observed occurring naturally on *A. majus*, *A. speciosum*, *A. nuttallianum*, *A. glandulosum*, *A. virga*, *A. molle*, and *Linaria dalmatica*. The symptoms were essentially alike on all these species.

Control of white grubs in strawberries, T. W. KERR, JR. ([New York] Cornell Sta. Bul. 770 (1941), pp. 40, pls. 2, figs. 13).—The application of certain sand-arsenical mixtures at planting time to the roots of strawberry plants resulted in the control of white grubs (*Phyllophaga* spp.). Sand, ground glass, and an aqueous mixture of calomel and gum arabic were found ineffective. Death of plants from arsenical injury or natural causes occurred within 47 days after the plants were set. The dates of maximum grub injury varied with the year and the stage of development of the grubs. In general the more concentrated the sand-arsenical mixture the greater the mortality of plants after treatment. Growth and runner production were reduced as the sand-arsenical mixtures were increased in concentration. Varieties responded differently to the various insecticides tested. The results indicated the possibility of treating strawberries with sand-arsenical mixtures while using a transplanter. No increase in either lead or arsenic was noted in strawberries picked from treated plants. The control method suggested is the use of 1 lb. of lead arsenate to 20 lb. of sand applied at the rate of 1.5 oz. (one handful) per plant at the time the plants are set in the field.

Studies on the biology of four common carpet beetles ([New York] Cornell Sta. Mem. 240 (1941), pp. 75, figs. 41).—This contribution is presented in two parts, as follows:

I. **The black carpet beetle (*Attagenus piceus* Oliv.), the varied carpet beetle (*Antrrenus verbasci* L.), and the furniture carpet beetle *Antrrenus vorax* Waterh., G. H. Griswold** (pp. 5–57).—The black carpet beetle, the varied carpet beetle, and *A. vorax* cause serious injury to materials of animal origin, and the first two are at times injurious to cereal products. Temperature conditions greatly influence developmental rate and length of adult life. All three species spend several months as larvae. The duration of the entire developmental period for the black carpet beetle was never less than 274 days; for the varied carpet beetle the developmental period ranged from 251 to 657 days and for *A. vorax* from 126 to 422 days.

II. *The old-fashioned carpet beetle (Anthrenus scrophulariae L.)*, M. Greenwald (pp. 58-60).—With the old-fashioned carpet beetle animal products of some form are essential in the diet for proper development. The larval development may be completed in from 52 to 80 days, but may require a longer period. The entire developmental period (egg to adult) ranges from 78 to 439 days. Under laboratory conditions adults spent from 56 to 84 days quiescent in the old larval skin and lived from 4 to 8 days after leaving this skin. Adults are pollen feeders and have been collected on 27 different plants.

External sex characters of two important native predators of the mountain pine beetle in sugar pine (Coleoptera: Ostomatidae, Cleridae), G. R. STRUBLE and L. H. CARPELAN. (U. S. D. A.). (*Pan-Pacific Ent.*, 17 (1941), No. 4, pp. 153-156, figs. 2).—The green trogositid *Temnochila virescens* (F.) *chlorodia* Mann. (Ostomatidae) and the red-bellied clerid *Enoclerus sphaegeus* F. (Cleridae), the most important insect enemies of the mountain pine beetle in sugar pine, are dealt with.

Crop rotations and wireworm injury to potato tubers, J. A. MUNRO and H. S. TELFORD (*North Dakota Sta. Bimo. Bul.*, 4 (1942), No. 3, pp. 21-23).—It was concluded from tests in 1940 and 1941 that, since potatoes apparently favor wireworm populations, growing potatoes on the same field every year or every other year without an occasional summer fallow is not advisable. Continuous rotations of small grains and potatoes are not recommended as small grains sustain wireworm populations. In order to reduce wireworms and consequent tuber injury summer fallow is suggested for potato land.

A note on *Lagochirus araneiformis* L. (Coleop.: Cerambycidae), R. L. BEARD. (Conn. [New Haven] Expt. Sta.). (*Ent. News*, 53 (1942), No. 3, pp. 61-62, pl. 1).

The biology and behaviour of *Ptinus tectus* Boie. (Coleoptera: Ptinidae), a pest of stored products.—I, The daily rhythm of locomotory activity, especially in relation to light and temperature, E. W. BENTLEY, D. L. GUNN, and D. W. EWER (*Jour. Expt. Biol.*, 18 (1941), No. 2, pp. 182-195, figs. 8).

Weevils (Coleoptera: Curculionidae) affecting chufa (*Cyperus esculentus*), A. F. SATTEETHWAIT. (U. S. D. A.). (*Ent. News*, 53 (1942), Nos. 1, pp. 11-16; 2, pp. 37-43).—Observations of several species of curculionids, of which chufa is the common host plant, are reported.

Report of findings and recommendations with reference to the gypsy moth project of the Bureau of Entomology and Plant Quarantine, C. F. KORBAN and A. G. RUGGLES. (Univ. Minn. et al.). (*Jour. Forestry*, 39 (1941), No. 12, pp. 973-977).—This is the report of a special committee appointed by the Chief of the U. S. D. A. Bureau of Entomology and Plant Quarantine to study the gypsy moth and the work that has been carried on by that Bureau and cooperating States in combating its spread.

Biological control of *Diatraea saccharalis* in the Florida Everglades during 1940 and 1941, J. W. WILSON (*Fla. Ent.*, 24 (1941), No. 3, pp. 52-57).—Of 11 species of parasites of the sugarcane borer introduced into Florida and Louisiana, 8 have become well established in Florida, namely, *Trichogramma minutum* Riley, *Metagonistylum minense* Towns., and *Bassus stigmaterus* (Cress.). It was found that the release of 11,000 *T. minutum* per acre did not appreciably decrease the damage caused by the sugarcane borer. Of releases of *M. minense* in cane fields of the Everglades in 1938 and 1939, recoveries were obtained in September and October 1941 in but 2 of 18 fields. Of 3,535 borers inoculated from June to September 1941 with larvae of *M. minense*, 48.6 percent produced parasites. *B. stigmaterus*, which was introduced into the State in shipments of *Ipoobracon rimac* in 1932 and has been spreading and

increasing in importance, was recovered from borer stages in 13 of 20 different localities during September and October 1941. The percentage of parasitization ranged from 3.4 to 41.4, indicating that this parasite has become widely established and is becoming economically valuable in borer control.

A study of the adult populations of the West Indian fruitfly in citrus plantings in Puerto Rico, L. C. McALISTER, JR., W. A. McCUBBIN, G. A. PRAFFMAN, W. T. OWREY, H. G. TAYLOR, and I. W. BERRYHILL (*Puerto Rico Sta. Bul.* 41 (1941), pp. 16, fig. 1).—Adults of West Indian fruitflies (*Anastrepha suspensa* Loew and *A. mombinpraeoptans* Señ) were present in citrus plantings in Puerto Rico throughout the year. At no period did the population of either species in citrus plantings exceed the number of each species that occurred in their respective preferred host trees. Evidence indicated that *A. suspensa* had a habit of migrating over large areas into various trees, including mango and citrus. It was thought that *A. mombinpraeoptans* has somewhat similar migratory habits. On the basis of present knowledge these species are not considered a menace to the citrus industry in Puerto Rico.

On surface tension of water in relation to behavior of Anopheles larvae, P. F. RUSSELL and T. RAMACHANDRA RAO (*Amer. Jour. Trop. Med.*, 21 (1941), No. 6, pp. 767-777, fig. 1).—A study of several types of habitat indicates that surface tension is not a factor in determining the distribution of species of *Anopheles*. The details of some experimental work on the behavior of *Anopheles* larvae when the surface tension of water is reduced are presented. Larvae fail to cling to the surface when the surface tension reaches a critical range, 27 to 36 dynes. Individual larvae show small differences in behavior, and there does not appear to be any difference in the minimal surface tension requirements of larvae of several species studied. Surface tensions of natural waters do not reach the low minimal ranges required to drown larvae.

Notes on the life history and artificial breeding of the Australian "stickfast" flea *Echidnophaga myrmecobii* Rothschild, M. W. MULES (*Austral. Jour. Expt. Biol. and Med. Sci.*, 18 (1940), No. 4, pp. 385-390, figs. 3).—Report is made of the life history of *E. myrmecobii*, including the technic and apparatus employed in its artificial cultivation in the laboratory. The optimum temperature for breeding the immature stages was found to be 22° C. Oviposition was stimulated during the cold weather by raising the room temperature to 22°.

Experimental transmission of endemic typhus fever by the sticktight flea (*Echidnophaga gallinacea*), J. E. ALICATA. (Hawaii Expt. Sta.). (*Jour. Wash. Acad. Sci.*, 32 (1942), No. 2, pp. 57-60, figs. 2).—Report is made of experimental work in which the virus of endemic typhus (Wilmington strain) was successfully transferred to sticktight fleas by allowing the fleas to feed on an experimentally infected rat. An emulsion of the feces of these fleas and an emulsion of the body of these fleas produced clinical typhus when inoculated into guinea pigs. Clear-cut cross-immunity was shown in guinea pigs inoculated with the virus from the fleas and with a known endemic typhus virus (Wilmington strain). Histological examination of the brain of one of the guinea pigs inoculated with the strain of virus recovered from the fleas revealed characteristic lesions of typhus fever. Agglutinins for *Bacillus proteus* OX₁₉ were demonstrated in the serum of a rabbit inoculated with the strain of virus recovered from the fleas.

Distribution and hosts of some fleas of economic importance, H. L. TREMBLEY and F. C. BISHOPP. (U. S. D. A.). (*Pests*, 10 (1942), No. 2, pp. 26-28).

A study of the frequency with which honeybees visit red clover (*Trifolium pratense*), together with an examination of the environmental conditions, C. G. BUTLER (*Ann. Appl. Biol.*, 28 (1941), No. 2 pp. 125-134, figs. 4).

Notes on the Argentine ant and other exotic ants introduced into Australia, J. CLARK (*Mem. Natl. Mus. Melbourne*, No. 12 (1941), pp. 59-70, figs. 3).

Thermal preference by Pharaoh's ant as a guide in control work, J. E. ARMAND (*Pests*, 10 (1942), No. 2, pp. 18-19).

Mole-cricket parasites of the genus *Larria* in Trinidad, A. M. ADAMSON (*Trop. Agr. [Trinidad]*, 19 (1942), No. 3, pp. 43-45).—These notes relate to the value of species of wasps of the genus *Larria* in combating *Scapteriscus vicinus* Scud. and *Gryllotalpa hexadactyla* Perty.

The coast tick (*Ixodes californicus* Banks) problem in British Columbia, J. D. GREGSON (*Canad. Ent.*, 74 (1942), No. 1, pp. 3-5).—The occurrence of this tick northward from California along the Pacific wet belt through Oregon and Washington into British Columbia and its importance as a pest of man, pets, and livestock in the coastlands of that province are noted. It is pointed out that the larval and nymphal instars of this tick feed readily on the lizard *Gerrhonotus principis* B. & G., this reptile appearing to be the main host of these stages, although both stages have been collected from squirrels, white-footed mice, and grouse. So far as is known the final or adult stage of the tick attacks only larger animals, and it is a common parasite on dogs, cats, deer, man, sheep, goats, and cattle. The adult is capable of becoming a serious pest of cattle and is also a potential pest of sheep and goats, upon which animals it feeds readily. It is also an annoying pest of man. Although not as yet incriminated in the transmission of any disease in British Columbia there is a danger of its becoming a disease carrier, since the related species, the castor-bean tick (*I. ricinus*), is a vector of several sporozoon and virus diseases as well as the causative agent of tick paralysis.

ANIMAL PRODUCTION

[Investigations in livestock production] (*Jour. Anim. Sci.*, 1 (1942), No. 1, pp. 57-66, 71-75, 81-87).—The following papers giving results of research were presented before the meeting of the American Society of Animal Production at Chicago in 1941, with brief abstracts of most of them:

The Design of Animal Husbandry Experiments, by E. W. Crampton (p. 57); The Physiological Approach to Livestock Nutrition Problems, by L. A. Maynard (p. 57) (Cornell Univ.); The Use of Cottonseed Meal in the Ration of Pregnant Ewes, by H. M. Briggs (p. 58) (Okla. Expt. Sta.); Studies on Important External Physical Characteristics of Wool, by M. E. Ensminger (p. 58) (Mass. State Col.); The Value of Rock Phosphate as a Mineral Supplement for Sheep, by J. D. Hatfield, C. L. Shrewsbury, and L. P. Doyle (p. 59) (Purdue Univ.); The Possibility of Hyperglycemia as an Etiological Factor in Feedlot Losses in Lambs, by P. B. Pearson and J. C. Miller (pp. 59-60) (Tex. A. and M. Col.); Relationship Between Weanling and Yearling Fleece Characters in Range Sheep, by E. M. Pohle (p. 60) (U. S. D. A.); The Importance of Body Weight in Selection of Range Ewes, by C. E. Terrill and J. A. Stoehr (pp. 60-61) (U. S. D. A.); Effect of Liberal Wheat Germ Oil Feeding on the Reproduction of Several Breeds of Sheep, by B. H. Thomas, W. F. La Grange, and C. C. Culbertson (p. 61) (Iowa State Col.); Fattening Western Lambs and Gummer Ewes, by J. C. Watson and F. U. Fenn (pp. 61-62) (S. Dak. Sta.); Horse Production Programs for Agricultural Colleges, by R. B. Cooley (p. 63) (Purdue Univ.); Vitamin C and Sterility in Horses, by G. K. Davis and C. L. Cole (p. 63) (Mich. Sta.); Horses and Mules—The Present Situation and Probable Future Trends, by W. Dinsmore (pp. 63-64); Breeding and Development of Medium Weight Draft Horses, by R. S. Hudson (p. 64) (Mich. State Col.); Light Horse Production and the College Program, by E. A.

Trowbridge (p. 64) (Univ. Mo.); Wintering the Beef Herd, by W. G. Kirk and R. M. Crown (pp. 64-65) (Univ. Fla.); A Discussion of Length of Feeding Period in Beef Cattle Record of Performance Tests, by B. Knapp, Jr., and W. H. Black (p. 65) (U. S. D. A.); Two Methods of Utilizing Bluestem Grass in Fattening Yearling Heifers for Market, by C. W. McCampbell and A. D. Weber (p. 65) (Kans. State Col.); Grazing Winter Wheat With Special Reference to the Mineral Blood Picture, by W. N. McMillen and W. Langham (p. 66); Some Texas Livestock Scenes Including Santa Gertrudis and Brahman Cattle, by D. W. Williams (p. 66) (Tex. A. and M. Col.); The Calcium and Phosphorus Relationship in Rations of Growing and Fattening Pigs, by G. Bohstedt, J. M. Fargo, W. A. King, and O. B. Ross (p. 71) (Univ. Wis.); Differences in Mothering and Nursing Ability of Sows as a Cause of Differences in Some Weights of Their Pigs, by H. O. Hetzer (p. 71) (U. S. D. A.); The Protein Requirement of Lactating Sows, Part I, by S. H. Work, L. A. Henke, and L. E. Harris (p. 72) (Univ. Hawaii); Possibilities of New Developments and Utilization of By-Products, by V. Conquest (pp. 72-73); Historical Review of By-Product Utilization, by J. H. Noble (p. 73); Application of By-Products to Livestock Prices, by P. C. Smith (p. 73); The Economic Significance of By-Products, by G. B. Thorne (p. 74); Competition of New Synthetic Materials for Packinghouse By-Products, by H. H. Young (pp. 74-75); Quality of Meat as Affected by the Rate of Freezing, by D. E. Brady, P. Frei, and C. W. Hickman (p. 81) (Univ. Idaho); Influence of Freezing Upon Tenderness in Aged Beef, by R. W. Bray, G. E. Vall, and D. L. Mackintosh (p. 81) (Kans. Sta.); Feed and Management Practices in Relation to Color in Beef, by D. H. La Vol (pp. 81-82); The Effect of Degree of Fatness on Tenderness of Lamb, by C. E. Murphey, A. K. Mackey, J. C. Miller, and S. Cover (p. 82) (Tex. Sta.); Recent Agronomic Developments in the Pasture Field of Interest to Animal Husbandmen, by H. L. Ahlgren (pp. 82-83) (Univ. Wis.); Problems of Range Land Conservation and Use, by W. R. Chapline (p. 83) (U. S. D. A.); Grain Versus Grass in Beef Production, by R. E. Hunt (p. 83) (Va. Sta.); Influence of Fertilizers and Lime on the Production, Palatability, and Nutritive Value of Pasture Hbage, by R. H. Lush (pp. 83-84); The Effect of Increased Pasture and Roughage on Livestock Production, by C. W. McDonald (p. 84) (Iowa State Col.); The Thiamin Requirements of Pigs as Related to the Fat Content of the Diet, by N. R. Ellis and L. L. Madsen (pp. 84-85) (U. S. D. A.); The Minimum Requirement of Pantothenic Acid for the Growing Pig, by E. H. Hughes and N. R. Ittner (p. 85) (Univ. Calif.); Nutritional Deficiencies of a Concentrate Mixture Composed of Corn, Tankage, Soybean Oilmeal, and Alfalfa Meal for Growing Pigs, by T. B. Keith, R. C. Miller, W. T. Thorp, and M. A. McCarty (p. 85) (Pa. State Col.); Selenium Poisoning in Livestock and Man, by A. L. Moxon (p. 85) (S. Dak. State Col.); A Scale of Heat Tolerance for Cattle, by A. O. Rhoad (pp. 85-86) (U. S. D. A.); The Effect of a Simplified Diet Upon Reproduction and Lactation in Swine and in the Rat, by O. B. Ross, P. H. Phillips, and G. Bohstedt (p. 86) (Univ. Wis.); and The Deficiencies of Non-Leguminous Roughages for Breeding Ewes, by C. L. Shrewsbury, C. Harper, F. N. Andrews, and M. R. Zelle (pp. 86-87) (Purdue Univ.).

[Investigations in livestock production at the Missouri Station] (*Missouri Sta. Bul.* 438 (1941), pp. 6-7, 11-12, 22-23, 23-25, 26, 43, 44, 56, 73-75).—The results in brief are presented by A. G. Hogan, J. W. Schroeder, E. M. Parrott, L. R. Richardson, E. G. Gahley, J. E. Comfort, J. M. Poehlman, M. W. Hazen, E. A. Trowbridge, H. C. Moffett, L. A. Weaver, S. Brody, E. M. Funk, H. L. Kempster, and C. A. Helm on investigations of cereal grass juice for rabbits; a nutritional anemia in poultry; simplified rations for chicks; nutritional requirements of brood sows; continuous rotation and supplemental graz-

ing cattle on bluegrass pastures; beef produced with minimum grain and maximum roughage; barley and corn for fattening cattle; corn, tankage, soybean meal, rape, and oat pasture for market hogs; rations for weaning pigs; energy efficiency of egg production; relation between heat increment of gestation and birth weight in different animal species from rats to horses; rotation pastures compared with cultivated crops in the production of feed for cattle; normal growth of chickens; the rate of growth of Rhode Island Red pullets infected with paralysis or leukemia; nutritional requirements of turkeys; factors influencing the hatchability of hen's eggs; rations for growth and egg production in poultry; and the feed purchasing power of eggs laid by a hen.

[Experiments in livestock production by the Cornell Station] ([*New York*] *Cornell Sta. Rpt. 1941*, pp. 98-99, 101-103, 108-109, 110-112, 113-115, 162-164).—Brief reports are presented of studies by D. B. Johnstone-Wallace, L. A. Maynard, C. M. McKay, L. L. Barnes, G. Sperling, L. Clise, O. Salmon, J. A. Saxton, H. E. Newlin, J. K. Loosli, F. B. Morrison, J. I. Miller, R. B. Hinman, C. S. Hobbs, J. P. Willman, P. Olafson, J. L. Krider, L. E. Hanson, L. C. Norris, G. F. Heuser, C. D. Caskey, J. McGinnis, G. F. Combs, and M. B. Gillis of variations in the feeding value of pasture herbage; the relation of nutrients to reproduction; the nicotinic acid and manganese requirements of calves, goats, and lambs; the deposition of fat in Herbivora; the nutritive value for farm animals of the proteins furnished by soybeans, corn gluten meal, linseed meal, and urea; a comparison of various protein supplements for fattening yearling steers and lambs; the relation of nutrition and management to the cause of the stiff-lamb disease; a comparison of various protein and vitamin supplements with minerals for growing and fattening pigs; the value of charcoal in rations for growing and fattening pigs; the role of manganese in the nutrition and bone formation of poultry; the cause and prevention of nutritional encephalomalacia in chicks; and the role of pantothenic acid in egg hatchability.

The minimum base value of heat production in animals: A research in the energy metabolism of cattle, E. B. FORBES and R. W. SWIFT (*Pennsylvania Sta. Bul. 415* (1941), pp. [1]+26, figs. 2).—Assuming a division of the heat production of fast between net energy for internal work and energy expense of utilization of the body nutrients katabolized, five steers were employed in four calorimeter experiments each of approximately 3 days. The energy katabolized on a basal ration was compared with energy measured on the basal ration to which there were additions of beef muscle and oleo oil and alfalfa and corn in separate periods. From these results it was calculated that 26.5 and 73.5 percent, respectively, of the metabolizable energy from beef muscle and oleo oil averaged the heat increment and net energy of the supplement. The heat production of fast minus the energy expense of utilization of fasting nutrients was designated the theoretical minimum base value of heat production. With equal amounts of time standing and lying the mean base value of heat production was 14.4 Calories per kilogram of body weight during fast, or 12.6 Calories in the lying position. These results gave evidence that the expense of the utilization of the energy of body fat and protein during fast was essentially the same as that of equivalent amounts of oleo oil and beef muscle as supplements to the basal ration. Dynamic effects of nutrients resulting in the sparing of body nutrients from katabolism, or implying the heat production of fast as a base value, are considered invalid. Heat production at or slightly above maintenance is considered the most practicable base from which to measure dynamic effects in nutrition.

Seasonal changes in the lignin and cellulose content of some Montana grasses, A. R. PATTON and L. GIESEKER. (Mont. Expt. Sta.). (*Jour. Anim.*

Sci., 1 (1942), No. 1, pp. 22-26).—The lignin and cellulose contents of Standard wheatgrass, Fairway crested wheatgrass, Slender wheatgrass, smooth brome-grass, and Mountain brome-grass cut at five stages of growth were shown to increase as the season advanced. The lignin content was about 5 percent in May and increased to about 18 percent in September, with cellulose closely paralleling it from about 20 to 40 percent. Lignin is not only practically indigestible itself, but it seems to decrease the availability of other constituents of forage crops.

[Report of the Association of American Feed Control Officials] (*Assoc. Amer. Feed Control Off.*, Off. Pub., 1942, pp. [2]+77).—The 1942 report of this association includes definitions of feeds; addresses on Coercion, Cajolery, and Cooperation in Feed Control, by J. B. Smith (pp. 41-44) (R. I. Sta.); Cooperation Between Feed Control Officials and the Feed Manufacturing Industry, by C. W. Woolman (pp. 45-47); Deterioration in Stored Feed, by L. L. Madsen (pp. 48-54) (U. S. D. A.); Poultry Nutrition and Feed Law Enforcement, by M. A. Jull (pp. 55-57) (Univ. Md.); New Features in Feed Examination, by W. C. Supplee (pp. 58-59); New Features in Feed Examination, by C. O. Gourley (pp. 60-62); and other information and discussions.

Commercial feeds in Kentucky in 1940, J. D. TURNER, S. B. RANDLE, W. G. TERRELL, and J. J. ROSE (*Kentucky Sta. Regulat. Ser. Bul.* 27 (1941), pp. 48).—This is the usual annual summary (E. S. R., 84, p. 373) of the inspection and analysis of 1,452 samples of commercial feeding stuffs and dog feeds, together with chemical standards for feeds, regulations to be followed by the trade and other pertinent information, and analyses of soybeans grown in Henderson County.

The use of phosphorus and calcium supplements for range livestock in New Mexico, J. H. KNOX and W. E. WATKINS (*New Mexico Sta. Bul.* 287 (1942), pp. 18, figs. 5).—Since studies of range grasses showed that they did not meet the requirements of cattle for minerals (E. S. R., 86, p. 77), studies of the adequacy of several mineral mixtures as supplements to meet these needs were conducted with range cattle of various ages over a 7-yr. period. The mineral mixtures were composed of steamed bonemeal and salt in equal parts and in the proportions of 60:40. Other mineral mixtures consisted of 40 parts dicalcium phosphate or monocalcium phosphate with 60 of salt. One year's experiment was also conducted with 75 range ewes employing salt and mixtures of 60 percent salt and 40 percent dicalcium phosphate. Although these experiments were conducted on range where deficient symptoms such as bone chewing and "creeps" were not evident, phosphorus and calcium supplements at will resulted in smaller death losses in newborn calves, larger number of calves weaned, greater weight of calves and lambs at weaning, greater gain in weight by yearling and 2-year-old cattle, and higher wool production from range ewes, as compared with salt as the single mineral supplement. On salt grass range cattle consumed little or none of the supplements because of the lack of desire for salt. The need for additional phosphorus seems to be the important guiding factor.

Grazing winter wheat with special reference to the mineral blood picture, W. N. McMILLEN and W. LANGHAM (*Jour. Anim. Sci.*, 1 (1942), No. 1, pp. 14-21).—Grazing wheat pasture proved to be an excellent source of calcium, magnesium, protein, and phosphorus for heifer and steer calves. In the study four lots of five to seven head each were pastured without supplements or with supplements of minerals (bonemeal, limestone, and salt) or with the minerals and sumac cane fodder. A dry lot group on millet silage, cane fodder, soybean meal, and milo grain with the minerals served for the control.

The average daily gains for 106 days were 1.12 lb. as compared with 1.3-1.5 lb. per head daily by the wheat pastured lots. Slightly better gains were made on the wheat pasture when the dry fodder was fed, but the minerals gave no benefit. Analyses of blood for serum calcium, phosphorus, and magnesium were not correlated with the mineral supplements in the diet or the occurrence of milk fever. It appeared that grass-tetany and milk fever may be complex nervous or glandular disturbances.

Fattening lambs on corn and cottonseed meal and on alfalfa and prairie hays, H. M. BRIGGS (*Oklahoma Sta. Bul. 252 (1941), pp. 14, fig. 1*).—In 3 yr., comparisons with 3 lots of lambs each year fed for 94-99 days cottonseed meal as a supplement fed in different amounts in excess of 0.1 lb. per head daily had an average value of 81.3 percent that of yellow corn when fed with alfalfa hay. Cottonseed meal apparently did not interfere with appetite or health or the production of desirable carcasses. In other lots fed over the 3-yr. period, prairie hay with limestone supplement had an average of 87.5 percent of the value of alfalfa hay when both were fed with corn and cottonseed meal. The addition of 0.3 lb. of alfalfa hay per day did not significantly improve the gains on the prairie hay ration. The feeding value of prairie hay varied from 37 to 100 percent that of alfalfa in the 3 yr. of the experiment.

A clipper for obtaining wool density samples, J. I. HARDY. (U. S. D. A.). (*Jour. Anim. Sci.*, 1 (1942), No. 1, pp. 34-37, fig. 1).—A clipper for defining the area from which a sample of wool was procured increased the accuracy, and more thorough sampling was obtained.

Supplementary value of various feedstuffs in brood sow rations, A. G. HOGAN and S. R. JOHNSON (*Missouri Sta. Res. Bul. 332 (1941), pp. 35, figs. 4*).—The basal ration of corn, tankage, linseed meal, and alfalfa meal, which was found in previous investigations (E. S. R., 84, p. 376) to be inadequate for brood sows, was improved, and the symptoms were much less severe or entirely eliminated when the ration was supplemented with certain combinations of feeding stuffs. Great improvement followed the addition of combinations including wheat germ, dried skim milk, dried yeast, and a commercial liver preparation. Alfalfa meal and wheat middlings improved the ration but were less effective at the levels tested. Fresh forage or pasture seemed to be completely effective. Even when fresh carrots were available the ration was not improved by their use. In miscellaneous observations no evidence was obtained of even a partial iodine deficiency. Excessive amounts of cod-liver oil produced disastrous results when included with the basal ration, but there was little or no effect from its inclusion with rations that were nearly or partially complete.

A study of the value of incubated eggs and methods of feeding them to growing and fattening pigs, J. P. WILLMAN, C. M. MCCAY, O. N. SALMON, and J. L. KEIDER. (Cornell Univ.). (*Jour. Anim. Sci.*, 1 (1942), No. 1, pp. 38-40).—The results of digestion trials with two pigs in which unhatched and infertile incubator eggs were fed with yellow corn and salt showed the protein and fat to be digested equally well from cooked and raw eggs. Gains of 1.2 lb. per head daily were made by 10 pigs on ground yellow corn, salt, and eggs as compared with 1.4 lb. on yellow corn, meat scraps, linseed meal, alfalfa hay, and salt. Not considering differences in the rate of gain it was calculated that 100 lb. of eggs had a replacement value of 14.4 lb. of yellow corn, 12.0 lb. of meat scraps, and 4.6 lb. each of linseed meal and ground alfalfa hay. Evidently swine are unique in their ability to digest raw egg albumen. In the rations of corn and raw or cooked eggs 89 percent of the protein and 83 percent of the fat were digested.

Swine production in Florida, A. L. SHEALY and W. J. SHEELY (*Fla. Univ. Agr. Ext. Bul. 111* (1941), pp. 59, figs. 35).—General information on swine production, including breeds, equipment, feeding, marketing, slaughtering, and disease, with special reference to Florida conditions.

Poultry: Science and practice, A. R. WINTER and E. M. FUNK (*Chicago: J. B. Lippincott Co.*, [1941], pp. VII+739, figs. 260).—This book gives special attention to poultry and egg production and marketing, including anatomy, breeds, and breeding. Chapters are also concerned with turkey, duck, geese, and game bird production.

Research in poultry nutrition in war-time, H. TEMPERTON and F. J. DUDLEY (*Empire Jour. Expt. Agr.*, 9 (1941), No. 36, pp. 248-264).—Brief results presented indicated that palm-kernel meal, tapioca meal, and coconut meal up to 20 and 25 percent of the mash were satisfactory for laying hens, but there was a loss in body weight with 40 percent of tapioca meal. Ground peanut meal, brewer's yeast, and "fodder" yeast also proved useful protein supplements for laying hens. Steamed potatoes were satisfactory to replace 5, 10, or 15 percent of the corn or the mash in rations for egg laying, but weights were reduced. Generally good results were obtained with ducks in the replacement of portions of the mash by potatoes and swedes. Variations in the composition of "town food waste" and failure of chickens to consume sufficient dry potato meal influenced the results accordingly. Limitation in feed consumption seemed to increase efficiency of egg production, but weight was reduced.

Chick raising in Oklahoma, R. B. THOMPSON (*Oklahoma Sta. Bul. 254* (1942), pp. 40, figs. 18).—Methods of housing, brooding, and caring for chicks are described.

Profitable feeding and management practices for poultry, L. N. BERRY (*New Mexico Sta. Bul. 286* (1942), pp. 19, figs. 6).—General principles of management, breeding, and feeding laying hens, pullets, and chicks for New Mexico conditions.

I, Poultry feeding experiments, H. EMBLETON. **II, Moulting and housing experiments**, H. B. HINDS (*Arizona Sta. Bul. 177* (1941), pp. [4]+331-365, figs. 11).—This is a revision of Bulletin 143 (E. S. R., 60, p. 701) on the basis of 1941 feed and egg prices.

Electric brooding under winter conditions, E. W. CALLENBACH, J. E. NICHOLAS, and R. R. MURPHY (*Pennsylvania Sta. Bul. 416* (1941), pp. [2]+28, figs. 14).—Brooding 3,532 chicks of the Single-Comb White Leghorn and Barred Plymouth Rock breeds under severe winter conditions up to 8 weeks of age with 7, 11, 15 and 19 sq. in. per bird in 8 groups with each breed led to the conclusion that "on the basis of mortality, growth, feed consumption, plumage condition, energy consumption, litter cost, labor cost, the same interest and depreciation costs per group for a brooder and house, and comparable interest and depreciation costs per group for other equipment, an allowance of 11 sq. in. of electric brooder area per chick was the most practical allowance in the two experiments." With a single exception, mortality was highest with the smallest space per chick. Feed consumption was directly related to brooder area, but differences in the two breeds were apparent. Growth of Barred Plymouth Rocks was related to brooder area but was not so evident with the White Leghorns. Damp litter under cold weather conditions necessitated frequent changes, especially as the chicks became older. Plumage character of the Barred Plymouth Rocks showed ♀s to be far superior to ♂s at 8 weeks but all differences favored greater brooder space. Mechanical difficulties in providing the electricity and controlling humidity are pointed out.

Electric light for egg production, J. ROBERTS and J. S. CARVER. (Wash. Expt. Sta.). (*Agr. Engin.*, 22 (1941), No. 10, pp. 357-360, 364, figs. 8; also in *Wash. Com. Relat. Elect. Agr., Ann. Rpt.*, 17 (1941), pp. 1-10, pls. 5).—Studies with groups of 20 fowls each in light- and temperature-insulated rooms but exposed to different durations of light treatment showed that 13 hr. of Mazda lighting per day was the minimum for high egg production. Increases in the duration of lighting did not increase egg production. Variations in light intensity from 1.0 to 31.3 footcandles did not have significant effects on production. Mazda plus CX, ruby red, and red fluorescent lighting did not have significantly different effects, provided 13 hr. lighting were available. Eight hr. of ruby red and red fluorescent light per day were insufficient to maintain a high rate of production.

Poultry lighting studies—1941-42, J. ROBERTS and J. S. CARVER. (Wash. Expt. Sta.). (*Wash. Com. Relat. Elect. Agr., Ann. Rpt.*, 17 (1941), pp. 11-13, fig. 1).—Continuing the above studies, a 14-hr. dark period without feed was too long for optimum egg production.

DAIRY FARMING—DAIRYING

[Investigations with dairy cattle and dairy products in Missouri] (*Missouri Sta. Bul.* 438 (1941), pp. 35-36, 38-43, 44-51, figs. 5).—Reports of investigations on the physiology of lactation by C. W. Turner, W. R. Graham, Jr., E. P. Reineke, V. E. Peterson, A. C. Ragsdale, H. A. Herman, A. J. Bergman, E. T. Gomez, A. A. Lewis, and R. P. Reece include precursors of the constituents of milk, particularly of lactose and milk proteins; the energy cost of milk secretion; factors affecting the solids-not-fat content of milk; the effect of thyroxine on milk production; the carbohydrate metabolism hormone; the composition of rabbit milk stimulated by the lactogenic hormone; factors in fish oils responsible for depressing the fat content of milk; the mammogenic hormone; and the lactogenic hormone of the pituitary.

From dairy cattle nutrition experiments by Ragsdale, Herman, R. G. McCarty, S. Brody, L. E. Washburn, V. Herring, R. Nisbet, and H. Kibler results are noted on the influence of certain rations and management practices on the rate of growth and milk production of dairy heifers; growth, blood picture, and related physiological phenomena in calves fed chiefly on milk diets; methane, hydrogen, and carbon dioxide production in the digestive tract of ruminants in relation to the respiratory exchange; diurnal metabolic and activity rhythms in the rat; energy metabolism level during gestation, lactation, and postlactation rest; a comparison of the amounts and energetic efficiencies of milk production in the rat and dairy cow; fermentation energy losses in dairy cattle; fasting energy metabolism during lactation; estimating live weight from chest girth of dairy cattle of unknown age; relation between physiological and gravitational weight; the course of fasting energy production curves in the lactating and dry dairy cows under similar environmental conditions; and the effect of fasting and refeeding on milk secretion in the cow and goat.

Reports of dairy products investigations by W. H. E. Reid, W. S. Arbuckle, and R. J. Drew include the effect of temperature upon butter, the effect of composition and serving temperature upon consumer acceptance and dispensing qualities of ice cream, and the use of moving pictures in ice cream investigation.

[Experiments with dairy cattle and dairy products at the Cornell Station] ([*New York*] *Cornell Sta. Rpt.* 1941, pp. 98, 100-101, 101-102, 104-106, 109-110, 120-121, 122-123).—Progress reports (E. S. R., 84, p. 805) are presented for the following investigations by L. A. Maynard, C. M. McCay, J. K. Loosli, M. J. Babcock, H. Lucas, J. K. Wilson, E. S. Savage, E. S. Harrison, N. P. Ralston, F. B. Morrison, R. W. Bratton, and G. W. Salisbury: The influence of the level

of fat and sources of fat in the ration upon milk and butterfat secretion; the nutritional requirements of calves as determined by feeding purified diets; the production of silage from crops high in protein; the palatability of grass silage preserved with phosphoric acid or molasses as compared with that of corn silage, and the nutritive value of molasses-legume-grass silage v. corn silage for milk production; the value of ground whole grains v. byproducts feeds in concentrate mixtures for milking cows; and the influence of quality of protein in the concentrate mixture fed in combination with mixed hay and corn silage for milking cows.

From studies with dairy products, by P. F. Sharp, E. S. Guthrie, D. B. Hand, I. C. Gunsalus, J. M. Sherman, J. C. White, H. J. Brueckner, A. Millenky, and V. N. Krukovsky, results are presented on the deaeration of market milk as a means of reducing oxidized flavor development and ascorbic acid destruction, the effect of the processing of milk on the reduced and total vitamin C content, the factors involved in the spoiling of milk held near freezing temperature, a comparison of high-temperature short-time pasteurization v. holder pasteurization of milk, and the physicochemical properties of the surface of milk-fat globules.

[Proceedings of the twentieth annual meeting, November 5-6, 1941] (*Vt. Dairy Plant Oper. and Mgrs. Assoc., Short Course Conf. and Ann. Mtg.*, 20, (1941), pp. 16-30, 35-75, 80-88, 96-131, figs. 5).—The following papers are presented in full: Factors to Consider in Setting a Fair Price for Milk, by L. Spencer (pp. 16-30) (Cornell Univ.); The Place of Dairy Products in the Diet, by F. B. King (pp. 35-46) (Univ. Vt.); Problems of the Milk Plant Operator, by H. J. Brueckner (pp. 47-52) (Cornell Univ.); Improving Dairy Cattle for Economical Production, by L. W. Lamb (pp. 53-60); Lessons Learned From Four Years of Artificial Breeding, by J. W. Bartlett (pp. 61-63) (Rutgers Univ.); Flexible Prices for Regulated Milk Markets, by L. Spencer (pp. 64-70) (Cornell Univ.); Accounting for Milk Fat, by E. O. Herreld (pp. 72-75) (Univ. Vt.); The Defense Program as Regards Dairy Production and Consumption and the Economic Implications for New England, by W. B. Silcox (pp. 80-88) (U. S. D. A.); The Influence of Handling and Aging Upon the Raw and Pasteurized Counts of Milk and of Pasteurized Cream, by W. H. Chilson and M. A. Collins (pp. 96-104); High-Temperature, Short-Time Pasteurization Methods and Equipment, by H. J. Brueckner (pp. 105-110) (Cornell Univ.); The Future of Milk Price Control, State and Federal, by E. G. Woodward (pp. 111-115) (Univ. Conn.); and The Milk and Cream Quality Control Program of the Boston Health Department, by F. E. Mott (pp. 116-131).

[Abstracts of dairy papers presented at the seventy-eighth annual meeting of the American Veterinary Medical Association] (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 774, pp. 205-206, 223-224).—Abstracts of the following papers of significance in dairying are given: Some Nutritional Deficiencies in Dairy Cattle, by C. F. Huffman (pp. 205-206); and Single-Service Containers for Distribution of Fluid Milk, by J. R. Sanborn (pp. 223-224).

[Progress in dairy research at Reading] (*Univ. Reading, Natl. Inst. Res. Dairying, Ann. Rpt.*, 1940, pp. 8-14).—A description of the research activities of the institute and the titles and references to 67 papers published during the year ended September 1940 (E. S. R., 84, p. 235).

Measurements and weights of one hundred cows in the Cornell dairy herd, E. G. MISNER ([New York] *Cornell Sta. Bul.* 771 (1941), pp. 21, figs. 4).—Continuing this series of studies (E. S. R., 82, p. 240), live weights and 18 body measurements were taken on 14 Ayrshire, 9 Brown Swiss, 22 Guernsey, 40 Holstein, and 15 Jersey cows. Averages of these data by breeds and the correlation between various measurements and of various measurements or combinations to butterfat produced are presented. Combining all breeds, the coefficient

of correlation between the adjusted best butterfat record of 78 cows and various measurements were weight 0.41, heart girth 0.43, height of hips 0.42, width of hips 0.50, maximum body circumference 0.38, body length 0.46, and index of size (sum of the width of hips, length of rump, and height of hips) 0.49. While size is shown to be definitely related to producing ability, it was emphasized that size indicates capacity rather than efficiency as applied to individual cows.

The quality of hay in dairy rations, C. A. CARY. (U. S. D. A.). (*Md. Agr. Soc., Farm Bur., Rpt.*, 25 (1940), pp. 192-203).—A paper presented before the thirty-fourth annual meeting of the Maryland Crop Improvement Association, stressing quality in hay as related to its carotene content and its value as a source of vitamin A for livestock.

Feeding of cows controls vitamin A content of butter, S. M. HAUGE. (Ind. Expt. Sta.). (*Food Indus.*, 14 (1942), No. 2, pp. 48-49, 98-99, fig. 1).—A general discussion, with reference to research noted (E. S. R., 77, p. 388; 84, p. 235).

Secretion of milk, D. ESPE (*Ames. Iowa: Collegiate Press*, 1941, 2. ed., pp. IX+294, [pl. 1], figs. 65).—The second edition of this book (E. S. R., 79, p. 677) follows the same general plan of subject matter presentation as the first edition. The bibliography has been extended to include 981 references.

A comparison of the acetone body metabolism of the lactating mammary gland of the normal cow with that of the cow with ketosis, J. C. SHAW. ([Conn.] Storrs Expt. Sta.). (*Jour. Biol. Chem.*, 142 (1942), No. 1, pp. 53-60).—Continuing this line of investigation (E. S. R., 86, p. 236), it was found that the lactating mammary gland of the cow in ketosis used 4.11 mg. percent of the β -hydroxybutyric acid but only 3.64 volume percent of the oxygen traversing the gland, whereas the gland of the normal cow utilized only 1.83 mg. percent of the β -hydroxybutyric acid but 4.83 vol. percent of the oxygen. It is calculated that practically all of the oxygen taken up by the gland of the cow with ketosis would be needed for the complete combustion of the β -hydroxybutyric acid removed from the blood of the gland, whereas only 37 percent of the oxygen would be thus utilized in the normal gland. Acetoneic acid was not utilized by the mammary gland of either the normal cow or the cow with ketosis.

The effect of thyroidectomy on lactation in the albino rat, D. KARNOFSKY (*Endocrinology*, 30 (1942), No. 2, pp. 234-239, figs. 3).—Uniform-aged groups of female albino rats were thyroidectomized (1) before conception, (2) during gestation, or (3) immediately after delivery. In all cases removal of the thyroid caused a diminution in lactation. However, thyroidectomy before conception or during gestation did not inhibit normal evolution of the mammary gland, indicating that the diminution of lactation after thyroidectomy probably is due to effects upon the pituitary gland affecting the formation of prolactin. Lactation was generally improved by thyroid replacement therapy in the thyroidectomized rats.

Changes in the fat percentage and fat yield of dairy cows with injections of an anterior pituitary preparation, J. F. SYKES, W. L. MEULEMAN, and C. F. HUFFMAN. (Mich. Expt. Sta.). (*Endocrinology*, 30 (1942), No. 2, pp. 217-220).—Four lactating cows received subcutaneous injections over a 5-day period of 500 mg. of an alkaline anterior pituitary extract. The average butterfat content of the milk was significantly increased during the period of injection, with little effect on the level of milk production. When the same cows later received injections of prolactin the volume of milk was significantly increased with little effect on the butterfat content. From these findings it is suggested that each component of the secretory process may be controlled by a separate specific hormone and that lactation is a result of the combined activity of these various substances.

Studies on pituitary lactogenic hormone.—V. Reactions with iodine, C. H. LI, W. R. LYONS, and H. M. EVANS. (Univ. Calif. et al.). (*Jour. Biol. Chem.*, 139 (1941), No. 1, pp. 43–55, figs. 2).—Continuing this series of investigations (E. S. R., 85, p. 607), it was found that when the lactogenic hormone prepared from beef or sheep pituitaries was iodinated the lactogenic principle was almost completely inactivated. The action of the iodine was confined to the tyrosine molecule of the hormone, suggesting that the tyrosine group is essential to the biological activity of the hormone. The isoelectric point of the iodinated hormone was shifted from pH 5.8 to about pH 4.7. At pH 3.8 or lower, there was no reaction between iodine and the hormone.

The physical structure of milk, E. L. JACK. (Univ. Calif.). (*Milk Plant Mo.*, 30 (1941), No. 3, pp. 25–26).—An interesting discussion of the particle size and shape of various milk constituents and their interaction in determining the physical condition of milk.

Standard methods for the examination of dairy products: Microbiological, bioassay, and chemical (*New York: Amer. Pub. Health Assoc.*, 1941, 8. ed., pp. XVI+288, pl. 1, figs. 33).—This is the eighth edition of this widely used handbook (E. S. R., 81, p. 704).

The differentiation of similar types of lactic acid bacteria, J. G. DAVIS (*Dairy Indus.*, 6 (1941), Nos. 6, pp. 160–162; 7, pp. 188–190).—A detailed description of the cultural characteristics and fermentation properties of about 58 types falling in the *Streptococcus* and *Lactobacillus* groups is presented. Techniques and media are described in detail.

Bacteria in well-waters, C. H. CASTELL and E. H. GARRARD (*Canad. Dairy and Ice Cream Jour.*, 20 (1941), No. 3, pp. 18–19).—Of 260 water supplies examined, about 10 percent were found to contain bacteria of intestinal origin and were thus unfit for human consumption, while approximately 30 percent showed the presence of butyric acid-forming anaerobes. A high percentage contained appreciable numbers of fat-splitting organisms capable of growth at 2° C., and the average count of all samples plated at an incubation temperature of 25° was over 100,000 per cubic centimeter. The significance of these findings as related to possible contamination of butter is discussed.

Mastitis and the plate count of milk.—I, A quantitative study of the growth of *Streptococcus agalactiae* in various plating media, M. E. MORGAN, E. O. ANDERSON, and W. N. PLASTRIDGE. (Univ. Conn.). (*Jour. Milk Technol.*, 4 (1941), No. 5, pp. 245–252).—Twenty freshly isolated cultures of *S. agalactiae* grown in milk were each plated on 5-percent ox blood agar, Edwards crystal violet esculin ox blood agar, old standard agar, and new standard medium. The growth of the organisms was essentially the same on the ox blood agar and the Edwards medium. Approximately the same number of colonies were supported on the old and the new standard mediums, but the mean exposed area of the colonies on the new standard medium was 420.3 percent larger than that of colonies on the old standard medium. In parallel tests, a significantly greater number of *S. agalactiae* colonies developed on the Edwards medium than on the new standard medium.

Studies of the resazurin-rennet test (preliminary report), F. L. SCHACHT and R. E. NICHOLS (*Jour. Milk Technol.*, 4 (1941), No. 5, pp. 281–284).—The resazurin-rennet test, as described, was compared with other quality tests on 730 weigh vat samples of milk adjudged as satisfactory by the odor test. Of this total, 3.2 percent decolorized methylene blue in 2 hr. or less, 7.1 percent showed a plate count of over 100,000 per cubic centimeter, 18.7 percent caused color changes indicating poor quality by the resazurin test, while 36.4 percent were classed as unsatisfactory under the resazurin-rennet test because of failure to

coagulate, or because of a change in color, or because of a combination of both reactions. Thus the resazurin-remnet test appeared to detect more milk of unsatisfactory quality than any of the other tests employed.

Coliform organisms and pasteurization, I—III, H. BARKWORTH (*Dairy Indus.*, 6 (1941), Nos. 5, pp. 132–133; 6, pp. 159–160; 8, pp. 217–218).—Experimental evidence is presented to indicate that *Bacterium coli* rarely survives the usual pasteurization temperatures and that from a practical standpoint the presence of coliform organisms in pasteurized milk indicates contamination following pasteurization. A proposed coliform test for pasteurized milk consists in incubating 100 cc. of milk for 24 hr. at from 70° to 75° F., after which a 1-cc. sample is then tested in the usual manner for coliform organisms. This method has marked advantage over the direct application of the test to unincubated samples of milk pasteurized either by the conventional vat-holder method or when high-temperature short-time processes are used.

Preliminary bacteriological study of market creams, E. D. ROBINSON, E. K. BORMAN, and F. L. MICKLE (*Jour. Milk Technol.*, 4 (1941), No. 5, pp. 253–257).—A total of 523 samples of market cream, including raw retail cream, pasteurized retail cream and import cream, were examined by the direct microscopic clump count and by plating at various incubation temperatures. It was found that 45.6 percent of the samples failed to meet tentative standards of 500,000 bacteria per cubic centimeter by the direct microscopic clump count, 18.3 percent when plated at 37° C. for 48 hr., 24.4 percent at 8° for 4 days, and 1.9 percent when plated at 55° for 48 hr. It was recommended that both the 37°- and 8°-incubation temperatures be employed in determining the bacteriological quality of cream. The true thermophiles appear to be of little importance in contributing to high counts, suggesting that their significance in cream may have been overemphasized. The desirability of employing a direct microscopic count in determining the bacterial population of cream is emphasized.

Value of producer interviews in reducing mold mycelia in butter, G. SMITH and W. L. SLATTER. (Ohio State Univ.). (*Natl. Butter and Cheese Jour.*, 33 (1942), No. 2, pp. 12–13, 50–52).—Working with cream producers milking less than 10 cows, the quality of cream produced by farmers interviewed at regular intervals regarding cream-quality improvement was compared with that of similar producers not interviewed. Pertinent data are presented. It is concluded that cream-quality improvement among small producers is difficult, and that the human element is by far the most important factor.

Canadian creamery buttermaking (*Canada Dept. Agr. Pub.* 723 (1941), pp. 32).—A practical handbook for the butter maker.

A comparative study of locally produced and imported butter, L. PARAAN (*Philippine Jour. Anim. Indus.*, 8 (1941), No. 4, pp. 321–336).—Ten samples of butter, including lots imported from the United States, Denmark, Australia, and New Zealand, and butter produced locally, were compared as to chemical composition, physical characteristics, and keeping quality. The imported butters generally were of good quality when received, but all deteriorated rapidly when exposed to temperatures of 28°–30° C. (82.4°–86° F.). Rancidity appeared to develop more rapidly in samples of relatively high curd content. Other imported lots were particularly susceptible to the development of metallic flavors. Danish butter containing 81.9 percent fat, 15.5 percent moisture, less than 1 percent curd, and mild salt had the best keeping quality of the imported butters. The local butter which contained only 12.03 percent moisture and a relatively high amount of fat exceeded any of the imported butters in keeping quality.

Manufacture of American cheese from pasteurized milk, H. L. WILSON. (U. S. D. A.). (*Natl. Butter and Cheese Jour.*, 33 (1942), No. 2, pp. 18–28).—A review and general discussion of the problem. The opinion is expressed that if

milk delivered to the cheese factories were carefully graded when received and then pasteurized and made into cheese under a definite schedule of proper methods, the rejection of cheese by Government inspectors would be greatly reduced. Pasteurization of milk for Cheddar cheese making for any section of the country is recommended.

The problem of rancidity in Cheddar cheese, E. G. HOOD, I. HLYNKA, and C. A. GIBSON (*Canad. Dairy and Ice Cream Jour.*, 20 (1941), No. 3, pp. 26, 28, 30).—Reporting briefly on a series of experiments, it is noted that typical rancid cheese could be produced experimentally by the addition to the cheese milk of commercial lipase or homogenized milk as a means of lipase activation. Following the addition of either, lipase could be at least partially inactivated by the use of varying amounts and proportions of rennet and pepsin. There was a tendency for cheese made from inactivated milks to fall in grade after a storage period of 6 weeks. The complexity of the problem involved and the need for further investigation in the field are discussed at length.

Research in ice cream during 1941, W. J. CORBETT. (Univ. Ill.). (*Ice Cream Trade Jour.*, 37 (1941), No. 12, pp. 14-15, 44-48).—A review, citing 25 references.

The control of shrinkage in ice cream, J. H. ERB. (Ohio State Univ.). (*Canad. Dairy and Ice Cream Jour.*, 20 (1941), No. 3, pp. 60, 62, 64).—In addition to a general discussion of this problem, experimental data are presented on the effect of the type of freezer and type of container on ice cream shrinkage. Under comparable storage conditions, ice cream from continuous freezers was slightly more susceptible to shrinkage than that from batch freezers. When held at very low (-30° F.) storage temperature the type of container had little influence on shrinkage, but at a temperature range of 0° - 12° ice cream in untreated or unlined paper containers showed materially greater shrinkage than that in paraffined paper or tin containers.

Some newer ice cream stabilizers and their functions, A. LEIGHTON. (U. S. D. A.). (*Ice Cream Trade Jour.*, 37 (1941), No. 12, pp. 12-13, 48-50, figs. 4).—In addition to a brief review of the literature, data are presented on the comparative effects of three types of stabilizers in ice cream manufacture. In comparison with gelatin, alginate stabilizers permitted freezing at a lower temperature without incipient churning of the butterfat, with a consequent increase in overrun. A monoglyceride-gelatin mixture was more effective than either gelatin or alginates with reference to the amount of air which could be whipped into a mix at a given temperature, particularly in the normal whipping range. Aging generally increased the whippability of the mixes, regardless of the stabilizer used. Aged mixes stabilized with alginate and monoglyceride-gelatin contained 6.6 and 18.7 percent, respectively, more ice at 100-percent overrun than a similar mix stabilized with gelatin.

VETERINARY MEDICINE

[Work in animal pathology and parasitology by the Missouri Station] (*Missouri Sta. Bul.* 438 (1941), pp. 83-87).—Reports of progress (E. S. R., 83, p. 242) of work by C. Elder, O. S. Crisler, A. J. Durant, and H. C. McDougale are given on a comparison of the tube agglutination and rapid or plate tests on low reacting serums in Bang's disease testing; retests on cattle giving suspicious reactions to Bang's disease tests; the transmission of Bang's abortion infection from swine to cattle under pasture conditions; toxemia in sheep; a study of cattle that consistently give low titer reactions to Bang's agglutination test; low Bang's agglutination test reactions in unbred virgin gilts; the pathology and comparative damage done by stomach, nodular, and tapeworms in sheep; fowl paralysis; blackhead in turkeys; and leucosis in fowls.

[Work in animal pathology and parasitology by the Cornell Station] ([*New York*] *Cornell Sta. Rpt.* 1941, pp. 107-108, 112-113, 121).—The work of the year (E. S. R., 84, p. 813) reported relates to the control of strongyles in horses, by G. W. Salisbury, D. W. Baker, and J. W. Britton; a comparison of treatments for the control of the worm parasites of the digestive tract of sheep and lambs, by J. P. Willman and D. W. Baker; and the variability of mastitis streptococci, by J. M. Sherman, E. C. Greisen, and C. F. Niven, Jr.

The incidence of parasitic infection in domestic animals, F. R. Koutz and R. E. Rebrassier. (Ohio State Univ.). (*Jour. Amer. Vet. Med. Assoc.*, 100 (1942), No. 780, pp. 214-216).—Records kept during the year 1940-41 of species and percentages of parasites found by laboratory tests in the various domestic animals and the incidence of parasitism indicated by blood, fecal, and skin examinations to determine the incidence of parasitic infection in the various species examined at the veterinary clinic of the Ohio State University are summarized in tables.

A note on the chemotherapeutic action of 4:4'-diamidino stilbene in *Babesia* infections of domestic animals, R. Daubney and J. R. Hudson (*Ann. Trop. Med. and Parasitol.*, 35 (1941), No. 2, pp. 187-190).—It appears from the few cases recorded that 4:4'-diamidino stilbene is of value in the treatment of clinical cases of tick fever in dogs due to *B. canis*. The drug has been found unsuitable for administration to horses despite its efficacy in the cure of billary fever. It has not as yet been tested on cattle suffering clinically from red water fever, although cattle have been found to tolerate doses many times greater than those likely to be needed.

Accessory growth factor requirements of some representatives of the *Brucella* group, S. A. Koser, B. B. Breslove, and A. Dorfman (*Jour. Infect. Diseases*, 69 (1941), No. 2, pp. 114-124, fig. 1).—Following a description of the materials and methods employed, experimental work is reported in which in the presence of certain accessory growth factors seven of eight strains of *Brucella* grew in successive transfers in amino acid-glucose-inorganic salt mediums. "The significant accessory factors are thiamin, nicotinamide, pantothenic acid, and probably biotin. Not all of these factors are actually required by all strains. Thiamin and nicotinamide supported growth of four cultures, though the growth was slow in some cases. Addition of pantothenic acid accelerated growth. Further addition of a biotin concentrate produced growth of three of the remaining four strains. In the case of one strain, more dependent upon pantothenic acid than the others, growth was more markedly stimulated by pantothenic acid than by either or both parts of the molecule. Other accessory factors such as riboflavin, vitamin B₆, adenine, inositol, and glutamine did not substitute for the required factors and when supplied along with those needed for growth did not accelerate cell multiplication. Diphosphothiamin (cocarboxylase) and diphosphopyridinenucleotide (coenzyme I) were of no greater value than thiamin and nicotinamide, respectively. Although a biotin concentrate was required by some cultures it produced no marked stimulation of several other cultures which were able to grow without it.

"Growth of some but not all strains was facilitated by thioglycolic acid. Assuming that the effect of thioglycolic acid is due to lowering the oxidation-reduction potential, it is concluded that different strains of *Brucella* vary in their potential requirements.

"The presence of certain concentrations of salt in the basal medium proved to be important, the optimum amount of sodium chloride being from 0.6 to 1 percent. With decreasing amounts of sodium chloride, in the presence of needed accessory factors, progressively slower growth occurred until with 0.1 percent or less most

cultures failed to grow. The effect of sodium chloride is apparently one of osmotic pressure, since potassium chloride, sodium sulfate, and potassium sulfate could be substituted for sodium chloride."

Equine encephalomyelitis and human encephalitis (*North Amer. Vet.*, 22 (1941), No. 11, pp. 665-669).

Natural resistance to helminthic infections, J. E. ACKERT. (Kans. Expt. Stu.). (*Jour. Parasitol.*, 28 (1942), No. 1, pp. 1-24, figs. 4).—In this presidential address, delivered at the meeting of the American Society of Parasitologists held in Dallas, Tex., in December 1941, the author reviews and analyzes the literature on factors in natural resistance, including diet, genetic constitution, and age, and presents new data on an inhibitory nematode growth factor in the duodenal mucus of older animals. Experimental results and epidemiological data indicate that the degree of resistance of a host to its helminth parasites is dependent largely upon its diet, its genetic constitution, and its age. Diets of man and other omnivorous animals, to serve in developing the most potent resistance, should include in the balanced ration an adequate amount of vitamins A, B (complex), and D, suitable minerals, and a range of proteins as supplied in cereals, meat, and milk. Such a diet taken from the young to the adult condition will ordinarily result in the development of a high natural resistance to helminthic infections. By selection it appears to be possible to alter the genetic constitutions in succeeding generations of animals in such manner as to increase their natural resistance to parasites. While the nature of the natural resistance has not been completely elucidated, there are indications that duodenal mucus from goblet cells contains a thermostable substance that inhibits the development of intestinal helminths.

A bibliography of four pages is included.

Some observations on corynebacterial infections, with particular reference to their occurrence in mule deer (*Odocoileus hemionus*) in British Columbia, F. A. HUMPHREYS and R. J. GIBBONS (*Canad. Jour. Compar. Med. and Vet. Sci.*, 6 (1942), No. 2, pp. 35-45, figs. 5).—Report is made of the isolation of a gram-positive bacillus from pathological conditions in four Rocky Mountain mule deer in British Columbia which has been identified as *Corynebacterium ovis*. It was found to be indistinguishable from strains of *C. ovis* isolated from sheep and also from a type culture of *C. ovis* obtained from the American Type Culture Collection.

Experiments carried out on two mule deer have shown that they are highly susceptible to sheep strains of *C. ovis* and may be infected by ingestion or entrance through the abraded skin. Similar experiments on two sheep have shown that they may be infected by oral and cutaneous exposures to deer strains of *C. ovis*, but sheep appear to be more resistant to the deer strains than are the deer to sheep strains. However, a lamb inoculated intravenously with *C. ovis* isolated from a deer died in 5 days with an acute pulmonary infection. Animal inoculation experiments with the organism isolated show guinea pigs and rabbits to be highly susceptible, white rats resistant orally but susceptible intraperitoneally, fitches resistant orally and fairly resistant intraperitoneally, magpies resistant orally but susceptible intraperitoneally, and chickens non-susceptible. Engorged female winter ticks (*Dermacentor albipictus* Pack.) removed from deer infected with *C. ovis* were shown by guinea pig inoculation to be harboring *C. ovis*. Seed ticks (larvae) reared from engorged females removed from the infected deer were also shown by guinea pig inoculation to be harboring *C. ovis*, indicating that the organism had been hereditarily transmitted.

Nutritional deficiency and infection.—I, Influence of riboflavin or thiamin deficiency on fatal experimental pneumococcal infection in white mice,

J. G. WOOLEY and W. H. SEBRELL (*Pub. Health Rpts. [U. S.]*, 57 (1942), No. 5, pp. 149-161, figs. 6).—In the experiments reported, mice deficient in riboflavin or thiamin were found more susceptible to a fatal infection with pneumococcus type I when inoculated by the intranasal route than were mice fed on a diet containing enough of these vitamins for good growth. Paired feeding experiments indicate that this effect in the mice on the riboflavin deficient diet is not due to a restricted total food intake. The daily administration of riboflavin or thiamin in amounts 5 to 10 times that in the control diet to the mice on diets deficient in these substances, respectively, at the time of inoculation with pneumococcus type I did not reduce the number of animals dying from the infection.

Studies in the epidemiology of Q fever, I-VIII (*Austral. Jour. Expt. Biol. and Med. Sci.*, 18 (1940), Nos. 1, pp. 1-8, figs. 3; 2, pp. 99-123, figs. 3; 3, pp. 193-200, fig. 1; 4, pp. 409-413, fig. 1; 19 (1941), Nos. 1, pp. 73-75, fig. 1; 2, pp. 133-136).—Reports of work conducted in the search for vectors and reservoirs of the disease due to *Rickettsia burneti* are: I, The Isolation of Six Strains of *Rickettsia burneti* From the Tick *Haemaphysalis humerosa*, by D. J. W. Smith and E. H. Derrick (pp. 1-8); II, The Isolation of Three Strains of *Rickettsia burneti* From the Bandicoot *Isodon torosus*, by E. H. Derrick and D. J. W. Smith (pp. 99-102); III, The Transmission of Q Fever by the Tick *Haemaphysalis humerosa* (pp. 103-118) and IV, The Failure to Transmit Q Fever With the Cat-Flea (*Ctenocephalides felis*) (pp. 119-123), both by D. J. W. Smith; V, Surveys of Human and Animal Sera for *Rickettsia burneti* Agglutinins, by M. Freeman, E. H. Derrick, H. E. Brown, D. J. W. Smith, and D. W. Johnson (pp. 193-200); VI, The Susceptibility of Various Animals, by E. H. Derrick, D. J. W. Smith, and H. E. Brown (pp. 409-413); and VII, The Biology of *Haemaphysalis humerosa* Warburton and Nuttall (Acarina: Ixodidae) in Queensland (pp. 73-75) (E. S. R., 86, p. 244) and VIII, The Transmission of Q Fever by the Tick *Rhipicephalus sanguineus* (pp. 133-136) (E. S. R., 86, p. 386), both by D. J. W. Smith.

A comparative study of the nutritional requirements of *Salmonella pullorum*, *Salmonella gallinarum*, and *Salmonella typhosa*, E. A. JOHNSON and L. F. RETTGER (*Jour. Bact.*, 43 (1942), No. 1, p. 103).—Report is made of a study undertaken primarily to determine the nutritional requirements of *S. pullorum* and *S. gallinarum* in a chemically defined basal medium of 16 amino acids with added thioglycolic acid and to compare these requirements with those of *S. typhosa*. "With the exception of 2 strains which required nicotinic acid or its amide, 43 strains of *S. pullorum* did not need any vitamins, while vitamin B₁ proved to be highly indispensable for the growth of all 22 strains of *S. gallinarum* tested. This nutritional difference serves further to separate these 2 antigenically similar species. Nearly all *S. pullorum* strains required glucose, while *S. gallinarum* could dispense with this sugar. None of the strains of the former organism was stimulated by the addition of CO₂, while several of the *S. gallinarum* strains definitely required the presence of appreciable amounts of this gas for growth. The indispensable amino acids were determined for 10 representative strains of *S. pullorum*, 10 of *S. gallinarum*, and 5 of *S. typhosa*. The amino acid requirements were variable between strains of *S. pullorum*, less so with *S. gallinarum*. Leucine was the most important single amino acid for both *S. pullorum* and *S. gallinarum*. Tryptophane was the only indispensable amino acid required by the 5 strains of *S. typhosa*. This finding is in sharp contrast with those of *S. pullorum* and *S. gallinarum*, which do not require tryptophane."

A histological comparison of the effects of certain drugs on scabies, as studied in rodent infections, R. M. GORDON and D. R. SEATON (*Ann. Trop.*

Med. and Parasitol., 35 (1941), No. 2, pp. 247-268, pls. 3, figs. 3).—Following a review of the literature relating to the treatment of scabies, the effect of certain drugs on *Notoedres* (*Sarcoptes minor*) infections of Syrian hamsters (*Cricetus auratus*), albino rats, and guinea pigs, as studied histologically, is reported. Four applications of dimethylthianthrene (mitigal) during a period of 10 days resulted in complete destruction of all the mites and their eggs found in the treated areas. This drug was subsequently used for purposes of comparison. The comparative tests revealed that tetraethylthiuram monosulfide was more lethal for the mites and eggs and more rapid in action than benzyl benzoate and dimethylthianthrene. The vehicle used for all the drugs tested, the methyl ester of the fatty acids of coconut oil, allowed the drugs to reach at least 90 percent of mites and eggs after a single application. A single application of the most potent drug tested, i. e., tetraethylthiuram monosulfide, appeared to have destroyed 76 percent of mites 24 hr. after its application to the washed skin and 100 percent after 3 days. The eggs are more resistant to treatment than the mites. A single application of tetraethylthiuram monosulfide caused the destruction of some 50 percent at the end of 24 hr. and some 78 percent at the end of 3 days. A list of 43 references to the literature is included.

The use of slide agglutination to determine pathogenicity of staphylococci, R. CHRISTIE (*Austral. Jour. Expt. Biol. and Med. Sci.*, 18 (1940), No. 4, pp. 397-400).—In the study reported, 57 of 392 strains of staphylococci were of animal origin and 335 of human origin. Of 269 coagulase-positive strains, 257 were agglutinated by a mixture of three antisera prepared from coagulase-positive strains; nine strains were autoagglutinable and could not be tested. One human and two animal strains were not agglutinated; the human strain was serologically related to the coagulase-positive strains in spite of its inagglutinability with the serum mixture. Of 123 coagulase-negative strains, 120 were not agglutinated, two were autoagglutinable, and one was agglutinated slightly. An attempt to produce agglutinating serums with coagulase-negative strains which would agglutinate coagulase-negative and not coagulase-positive strains was unsuccessful.

Distribution of Well's disease in the United States and methods of diagnosis in man, dogs, and rodents, A. PACKCHIANIAN (*Jour. Bact.*, 43 (1942), No. 1, pp. 66-67).—Through use of the microscopic agglutination and susceptible animal inoculation tests the author has diagnosed 40 human and 25 dog cases of Well's disease in the United States since 1937. *Leptospira* were likewise isolated from wild rats captured in New York City, Washington, D. C., and Detroit, Mich. Several species of American deer mice were found to be very susceptible to *L. icterohaemorrhagiae*, the average duration of the illness in the susceptible species (over 600 animals) being about 5 days. Of the several species found equally susceptible to *Leptospira*, the albino deer mouse (*Peromyscus maniculatus*) is suggested as the ideal test animal for use in studies of this organism.

Wound treatment with sulfanilamide and sulfathiazole (*North Amer. Vet.*, 22 (1941), No. 11, pp. 676-678).

Internal parasites of cattle, G. DIKMANS (*U. S. Dept. Agr. Cir.* 614 (1942), pp. 40, figs. 12).—A practical summary of the endoparasites of bovines and methods of treatment and prevention.

Intestinal pathology in experimental bovine esophagostomiasis, J. S. ANDREWS and J. F. MALDONADO. (P. R. Univ. Expt. Sta.) (*Amer. Jour. Vet. Res.*, 3 (1942), No. 6, pp. 17-27, figs. 2).—In this further investigation (E. S. R., 86, p. 90) the nodular worm *Oesophagostomum radiatum* was shown to be capable of producing severe pathologic changes in the intestines of previously healthy calves

artificially infected with large numbers of the infective larvae. The larvae were found to penetrate the intestinal wall anywhere from the pylorus to the anus, but the majority of them entered the ileum, cecum, and colon. Wherever the larvae penetrated they were found in all parts of the intestinal wall from the mucosa to the outer muscular coat, inclusive, but the principal inflammatory changes were seen in the submucosa. The lesions in the intestines of calves infected with single doses of larvae were found to be relatively mild and were made up of polymorphonuclear leucocytes. In this group the pathologic process reached its height about 10 days after infection, and the majority of the lesions had disappeared from the intestine 22 days later, or 32 days after infection. Bacteria were apparently of little importance as agents of secondary infection in the cases of experimental esophagostomiasis studied. This finding was contrary to the observations of other investigators who have reported that bacteria were apparently involved in esophagostomiasis of both sheep and cattle. The importance of bacteria in esophagostomiasis of sheep appears to depend upon the frequent perforation of the intestinal wall by the larvae of *O. columbianum*, which thus introduce the organisms into the peritoneal cavity where they give rise to fatal peritonitis. Perforation of the intestine of calves by the larvae of *O. radiatum* does not appear to occur as often as it does in sheep, due perhaps to the relatively greater thickness of the wall of the bovine intestine. No demonstrable pathology was observed in calves harboring infections composed of adult *O. radiatum*, thus indicating that the pathologic changes in the intestine of calves suffering from esophagostomiasis were apparently confined to the tissue destruction and inflammation arising from the invasion of the intestinal wall by the nodular worm larvae.

The nerve supply to the bovine mammary gland, L. E. ST. CLAIR. (Iowa State Col.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 6, pp. 10-16, figs. 3).—Report is made of an attempt to establish in detail the innervation of the bovine mammary gland.

An investigation into the infection of cows with *Trichomonas foetus* by means of the agglutination reaction, W. R. KERR and M. ROBERTSON (*Vet. Jour.*, 97 (1941), No. 11, pp. 351-365).—A description is given of the application of the agglutination reaction in the study of the serums of cows infected with *T. foetus*. The serums of 120 animals with histories of sterility and/or abortion were examined for the agglutinins against *T. foetus*, 25 animals showing a definitely raised titer, i. e., giving a positive reaction with living *T. foetus*. The connection of the raised titer and the disease was established in certain cases where the organism was present in the aborted fetus and no other cause of abortion could be detected by cultural methods. The positive titer was also present in certain cases of early return of oestrus at 6 weeks accompanied by a discharge in which there were numerous *Trichomonas*. The duration of the raised titer in the serums of aborted animals is variable but may last several months. Both the acquiring and the loss of the enhanced agglutination titer requires further study. The limitations of the test as a means of diagnosis are stressed, while its usefulness as a method of studying the course of the disease is pointed out. A positive reaction has been associated with *Trichomonas* abortion and has never been found in the serums of animals with perfectly normal histories.

An account of a *Trichomonas* infection in a self-contained herd is appended (pp. 363-365).

The action of two aromatic diamidines on *Trypanosoma congolense* infections in cattle, with a note on delayed poisoning by 4:4'-diamidino diphenoxy pentane, R. DAUBNEY and J. R. HUDSON (*Ann. Trop. Med. and Parasitol.*, 35 (1941), No. 2, pp. 175-186).

Bovine tuberculosis in the Tropics, with special reference to Uganda, I, J. CARMICHAEL (*Jour. Compar. Pathol. and Ther.*, 52 (1939), No. 4, pp. 322-335, figs. 2).—This first contribution is presented with a list of 34 references to the literature.

Bovine tuberculosis in the Tropics, with special reference to Uganda, II, J. CARMICHAEL (*Vet. Jour.*, 97 (1941), No. 10, pp. 329-339, pl. 1).—In experimental work (see above) in which eight zebu calves and three Ankole calves were inoculated subcutaneously with 50 mg. of a bovine strain of tubercle bacillus of standard virulence, the zebu calves showed a marked resistance to tuberculous infection as compared with calves of British breeds, while the Ankole calves proved equally susceptible.

An investigation to determine the sensitizing agent in cattle tested with mammalian and with avian tuberculin, W. H. FELDMAN and H. E. MOSES (*Amer. Jour. Vet. Res.*, 3 (1942), No. 6, pp. 3-9).—In attempts to demonstrate tubercle bacilli by culture methods and by the inoculation of guinea pigs with the tissues of cattle that had reacted to avian or to mammalian tuberculin, or to both of these products, 3,073 cattle, comprising 99 separate herds in the State of South Dakota, were tested. "One hundred and one animals reacted positively to the test (3.3 percent) and were slaughtered. Lesions considered at necropsy to be those of tuberculosis were present in 45 carcasses, so-called skin lesions only were found in 16, while in 40, or approximately 39.6 percent, no lesions of tuberculosis were observed. In 23 instances, all representing cattle in which lesions of tuberculosis were found at necropsy, tubercle bacilli were demonstrated. All strains were proved by animal pathogenicity tests to be of the bovine type. Although tuberculosis was present in the poultry on 23 of the 99 premises, the avian tubercle bacillus was not obtained from any of the tissues examined.

"From the data obtained it is concluded: (1) The previously recognized fact that many cattle presumably sensitized by bovine tubercle bacilli will react to avian tuberculin administered intracutaneously has been confirmed. In most instances, however, the reactions are less pronounced to avian tuberculin than to mammalian tuberculin. (2) Among animals that react positively to either avian or mammalian tuberculin there occur a considerable number in which by the methods available the agent responsible for the sensitization cannot be determined or is obscure. (3) The possibility that agents other than tubercle bacilli are capable of sensitizing cattle to tuberculin should be reexamined. (4) The agent responsible for detectable lesions of tuberculosis in cattle in the great majority of instances is the bovine tubercle bacillus. The avian and the human types of the organism are of minimal importance. (5) Apparently it is difficult at the time of the necropsy to differentiate in some instances lesions of tuberculous adenitis from minimal lesions of adenitis due to ray fungi infections. (6) Regardless of possible shortcomings, the intradermic tuberculin test when properly applied and intelligently interpreted still remains the most reliable single method for the detection of infections of cattle due to the tubercle bacillus."

Observations on the pathology of dairy calves on low vitamin A diets, W. T. S. THORP, H. A. KENER, S. I. BECHDEL, and N. B. GUERRANT. (Pa. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 6, pp. 27-31, figs. 12).—A gross and microscopical study for pathologic changes was made of 25 calves fed three different suboptimal levels of carotene. Degenerative and inflammatory changes were observed in the kidneys of calves on the lower levels of vitamin A. An enteritis with some thickening of the mucosa accompanied by a persistent diarrhea was observed. Degeneration and necrosis were present to a variable extent in the liver. Degenerative changes also were observed in the testicle. These probably inhibited normal spermatogenesis. Metaplasia of the epithelial tissues was

not consistently observed. A correlation appeared to exist between the lesions in the intestines and in the kidneys, both in extent and severity. In a limited number of cases the liver could be included in this relationship. In general, the lesions observed were more conspicuous in the calves which had received the lowest levels of vitamin A.

A filterable virus from pneumoenteritis of calves, J. A. BAKER (*Jour. Bact.*, 43 (1942), No. 1, pp. 89-90).—Studies made of the prevalent disease of calves known as pneumoenteritis led to the conclusion that it is caused by a filterable virus. The agent secured which, after serial passage, produces a pneumonia in white mice is present in the pneumonic lung in early cases as well as in the blood stream and various organs. After passage through a series of mice the agent is still capable of producing disease in the calf when inoculated intranasally. In two experiments the disease was transmitted from calves inoculated with the passed material to normal calves by pen contact. Calves and mice that have recovered from the experimental disease are resistant to subsequent infection, and the former develop neutralizing antibodies. Serums from calves that have recovered from the natural disease also neutralize the agent. Cultures from the infected lungs of calves and mice as a rule show no growth, and material that has been passed through Berkefeld N filters produces the characteristic disease.

Sulfapyridine in the treatment of calf pneumonia, W. T. S. THORP, J. F. SHIGLEY and A. K. ANDERSON. (Pa. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 100 (1942), No. 780, pp. 225-228).—Sulfapyridine was administered to 24 calves, 18 of which had symptoms of acute broncho-pneumonia. The results of blood determinations of 8 of the calves indicate that the blood level should not exceed 10 mg. percent. A significant rise in the leucocyte count, followed by a neutropenia and lowering of the erythrocyte count, was observed in the cases where toxic symptoms occurred. Younger calves were more subject to symptoms of toxicity. The following initial dosages are suggested: Calves up to 70 lb., 0.05 gm. per pound of body weight; calves 70-100 lb., 0.06 gm.; and calves over 100 lb., 0.07 gm. per pound of body weight.

Studies on the blood copper of sheep and of cows, A. B. BECK (*Austral. Jour. Expt. Biol. and Med. Sci.*, 19 (1941), No. 4, pp. 249-254).—There appears to be no absolute correlation between low blood copper levels and the development of anemia in copper-deficient sheep and cows, although anemia generally occurs if the level falls below 0.1 to 0.2 mg. of copper per liter for any length of time. The copper content of the blood of normal Western Australian sheep varies between 0.4 and 1.6 mg. of copper per liter; most figures, however, lie between 0.6 and 1.2 mg. per liter. Hemoglobin figures for the same sheep lie between 9.3 and 17.4 gm. per 100 cc. Normal cows show blood copper values between 0.7 and 1.7 mg. of copper per liter and hemoglobin figures between 8.6 and 16.8 gm. per 100 cc.

Experiments in connexion with an attempt to produce a neurotropic strain of vaccinia virus in sheep, E. C. SMITH, E. S. HORGAN, and MANSOUR ALI HASFEB (*Jour. Hyg. [London]*, 41 (1941), No. 5-6, pp. 509-520).—Experiments conducted with a view to the production of a sheep strain of neurovaccinia are reported. A strain of neurovaccinia fixed in mouse brains showed an incubation period of 3 days for mice. This strain was fixed for rabbits after a few passages with an incubation period of from 4 to 5 days. Three serial passages failed to fix the strain for sheep. Rabbit-sheep passage failed also to infect sheep.

An outbreak of listeriosis in sheep, J. A. HENDERSON. (Univ. Ill.). (*North Amer. Vet.*, 22 (1941), No. 9, pp. 545-546).—Account is given of an outbreak of listeriosis in a large flock of sheep, with a history of previous *Listeria*

infection, which appeared in December and subsided in April. A mortality of 55 ewes, 2 rams, and 19 lambs resulted. Subcutaneous inoculation with a formalized, killed *Listeria* culture apparently failed to reduce the mortality rate materially. Larger doses of formalized, killed culture may be worthy of further trial. The results obtained from the administration of sulfanilamide to the affected animals were not promising.

An outbreak of listerellosis in Oregon sheep, O. H. MUTH and D. R. MORRILL. (Oreg. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 100 (1942), No. 780, pp. 242-243, fig. 1).—In an outbreak which involved at least 8 in a band of 3,000 ewe lambs on cut-over land in western Oregon, *Listeria monocytogenes* was isolated from the brain. Animals affected exhibited typical circling symptoms and other evidence of encephalitis such as apparent blindness and standing with their heads against objects. Autopsy revealed no gross lesions except possible slight congestion and edema of the brain.

Use of phenothiazine in Oregon sheep, J. N. SHAW. (Oreg. Expt. Sta.). (*North Amer. Vet.*, 22 (1941), No. 5, pp. 280-283).—In the experiments reported phenothiazine failed to control parasites of sheep, the chief cause of losses, especially in the Willamette Valley.

Phenothiazine as an anthelmintic for sheep, V. E. WHITEHURST, JR., and L. E. SWANSON. (Fla. Expt. Sta.). (*Jour. Anim. Sci.*, 1 (1942), No. 1, p. 62).—The treatment of an experimental flock of sheep in which parasitic infestations had become a serious problem is referred to. The administration at monthly intervals for 14 consecutive treatments of 25 gm. of this anthelmintic mixed in 250 gm. of concentrates following a 24-hr. period of fasting reduced the death loss from 15.87 percent in 1939-40 to 1.54 percent in 1940-41. The control lot made slightly greater gains during the first 4 mo. of the experiment, but lost considerably more weight during lambing time than did the treated sheep. Twelve mo. after the experiment began the treated sheep continued to make gains in weight from month to month, while the control group lost weight rapidly and began to die as a result of the heavy parasite burden.

Further studies on overeating (enterotoxemia) of feedlot lambs, G. S. HARRISFIELD, F. CROSS, and A. B. HOERLEIN. (Colo. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 6, pp. 86-91).—In continuing the work previously noted (E. S. R., 80, p. 108) the majority of the filtrates prepared from the intestinal contents of overeating cases were found toxic for laboratory animals, thus confirming the previous findings. The toxin produced in culture by *Clostridium welchii* strains isolated from overeating cases was greatly increased in potency by normal intestinal filtrate and by pancreatin. The potency of the activated toxin compared favorably with that of the intestinal filtrates from overeating cases. Like effects were not produced by normal abomasum filtrates or pepsin. A marked rise in the blood sugar resulted when toxic intestinal filtrates, culture toxin, or activated toxin were injected intravenously. Sugar was frequently present in the urine of field cases and in the animals inoculated intravenously. Death resulted in three out of eight lambs which were given cultures of a strain of *C. welchii* isolated from an overeating case in conjunction with a large feed of grain or milk.

Control of the hog-kidney worm *Stephanurus dentatus*, W. L. THRELKELD and E. P. JOHNSON. (Va. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 6, pp. 72-76).—Report is made of preliminary field and laboratory experiments conducted. The findings indicate that there may be at least two ways in which the results may have practical value: (1) Small quantities of phenothiazine sprinkled about the feeding troughs, houses, and places where the sows most frequently urinate may prevent the eggs excreted in the urine from becoming infective for the pigs; and (2) repeated doses of phenothiazine ad-

ministered to the sow during the period the pigs are with the sows may result in sufficient amounts of the oxidation products in the urine to prevent the eggs from becoming infective for the pigs.

Studies on equine encephalomyelitis.—II, A nonantigenic strain of pigeon-brain virus, R. GRAHAM and N. D. LEVINE. (Univ. Ill.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 6, pp. 42-44).—In further work (E. S. R., 86, p. 528) a strain of western equine encephalomyelitis virus (11,399) was passaged through 10 successive pigeon transfers by inoculating 0.1 cc. of a dilution of 1:1,000,000 of pigeon-brain-tissue virus. Titration of two separate lots of the virus in the pooled pigeon-brain tissue revealed concentrations of 1,000,000,000 to 10,000,000,000 or more guinea pig-lethal doses and 10,000,000,000 or more pigeon-lethal doses per gram of brain tissue upon intracranial inoculation. Two separate lots of pigeon-brain vaccine prepared from the eleventh pigeon transfer were inactivated by the addition of 0.5 percent formalin. Neither lot of vaccine was measurably protective in guinea pigs against intracranial inoculation of 0.1 cc. of a dilution of 1:500 of homologous pigeon-brain virus.

Equine encephalomyelitis in Massachusetts, V. A. GETTING (*New England Jour. Med.*, 224 (1941), No. 24, pp. 999-1006, figs. 5).—This is an analysis of the outbreak of 1938 as reported by Feemster (E. S. R., 80, p. 686), together with a follow-up of cases and a report of a mosquito survey.

"Three salt-marsh species, *Aedes cantator*, *A. sollicitans*, and *A. triseriatus*, and three fresh-water species, *A. atropalpus*, *A. triseriatus*, and *A. vexans*, all vectors of equine encephalomyelitis, were collected by the survey in 1939. The former are usually limited to within 10 miles of salt water. Two, the fresh-water vectors *A. triseriatus* and *A. vexans*, were State-wide, the latter being 5 to 15 times as prevalent as the former. *A. vexans* is probably the most important vector of equine encephalomyelitis in Massachusetts. Along the coast the *A. sollicitans* and *A. cantator* are about as numerous as *A. vexans* and may have been, in part, responsible for the outbreak of 1938 in the coastal region."

Epidemiological aspects of encephalitis in the Yakima Valley, Washington: Mixed St. Louis and western equine types, W. M. HAMMON and B. F. HOWITT. (Univ. Calif.). (*Amer. Jour. Hyg.*, 35 (1942), No. 2, pp. 163-185, figs. 5).—A further presentation of findings in work conducted in the Yakima Valley of Washington State (E. S. R., 86, p. 386).

Equine periodic ophthalmia, T. C. JONES (*Amer. Jour. Vet. Res.*, 3 (1942), No. 6, pp. 45-71, figs. 25).—Periodic ophthalmia is described by the author as a recurrent lymphocytic iridocyclitis of Equidae characterized by acute, quiescent, and old stages. It is discussed from the standpoint of its epizootiology, etiology, course and symptoms, diagnosis, treatment, and pathology. It usually occurs as a slow-spreading enzootic, but sudden and severe outbreaks also are reported. Ophthalmology as it applies to veterinary medicine is considered. Treatment is described for the acute stage. This is limited to symptomatic treatment of the affected eye and nonspecific protein reaction therapy. The best available treatment may shorten the course of the acute attack and prevent many of the common sequels, but no effect upon the recurrence of symptoms can be expected. The gross and microscopic lesions in all stages of the disease are described and discussed in detail. The lesions in the acute case are limited for the most part to the iris and ciliary body.

Phenothiazine: Its role in the control of parasites of horses, W. E. SWALES (*Canad. Jour. Compar. Med. and Vet. Sci.*, 6 (1942), No. 2, pp. 50-54).

The effects of hyperplastic endometritis on the blood cytology of the dog, M. L. MORRIS, J. B. ALLISON, and J. I. WHITE. (Rutgers Univ.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 6, pp. 100-105, figs. 5).

Treatment of canine babesiosis by 4:4'-diamidino diphenoxy propane, J. CARMICHAEL and R. N. T-W-FIENNES (*Ann. Trop. Med. and Parasitol.*, 35 (1941), No. 2, pp. 191-193).—In the treatment of 116 cases of *Babesia canis* infection of dogs with 4:4'-diamidino diphenoxy propane no cases of toxicity were observed. The intramuscular administration is recommended, since edematous swellings may follow the subcutaneous injection.

Salmonella types in silver foxes, R. G. BENEDICT, E. McCox, and W. WISNICKY. (Univ. Wis.). (*Jour. Infect. Diseases*, 69 (1941), No. 2, pp. 167-172).—In the course of a routine examination of 286 specimen consignments of silver foxes from six States, 149 were diagnosed as due to distemper, 28 to fox paratyphoid, and the remainder to miscellaneous disorders. The differentiation of distemper and fox paratyphoid on a gross pathological basis is difficult, especially in chronic cases. Several types of *Salmonella* are reported. These include the following species: *S. typhimurium*, *S. choleraesuis kuzendorf*, *S. newport*, *S. pullorum*, and *S. anatum*. A number of *Salmonella* variants are mentioned because of their agglutinability in a *S. typhimurium* antiserum. *S. typhimurium* and *S. choleraesuis kuzendorf* were the most common types encountered in fox paratyphoid and distemper. The occurrence of *S. pullorum* and *S. newport* is recorded in foxes for the first time. The significance of the former is doubtful, since its recovery was effected in only 2 out of 27 fox carcasses examined in a particular epizootic. The pathogenicity of the *Salmonella* variants, so-called paracolon, may have been of significance. These organisms were recovered from a large number of foxes and some of them were antigenically related to *S. typhimurium*. It is concluded that *S. typhimurium* and *S. choleraesuis kuzendorf* should be further investigated in order to evaluate more accurately their pathogenicity for foxes under a variety of conditions.

Observations on bacterin treatment of Salmonella typhi-murium infections in chinchillas, D. R. COBURN, W. H. ARMSTRONG, and P. W. WETMORE (*Amer. Jour. Vet. Res.*, 3 (1942), No. 6, pp. 96-99, fig. 1).—Report is made of what is believed to be the first authentic case of paratyphoid (*S. typhimurium*) infection in chinchillas. In a study of this infection in a herd of approximately 200 animals, 44 post-mortem examinations, with culture preparations, were made. From these examinations 32 specimens were diagnosed as paratyphoid and the remainder as dietary and miscellaneous disorders. The antigenic formula of the organism isolated from 32 specimens is IV:1:1.2 and represents a strain ordinarily related to pigeons. No relationship between pigeons and the infected animals could be determined in this instance. The gross pathology of the disease is described, giving characteristic post-mortem appearances. The application of a bacterin treatment and the effects on animals well advanced in pregnancy is described. It is concluded that chronic, acute, and peracute cases will be observed in a herd of mixed ages and sexes. Chinchillas respond well to autogenous bacterin treatment, and no carrier animals were detected by repeated culture tests of fecal material. Wild rodents may be the source and means of spread of the infection in the herd. Immunization of the dam and sire early in the period of pregnancy greatly enhances the production of living litters and the survival of the young.

Bibliography of poultry diseases (*Bibliog. Poultry Diseases, Lab. Workers Pullorum Disease Control* [New Brunswick, N. J.], 6 (1941), Nos. 1, pp. [2]+14; 2, pp. [2]+16).—A continuation of this bibliography (E. S. R., 85, p. 113).

Inheritance as a factor in poultry-disease research, C. A. BRANDLY and N. F. WATERS. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 6, pp. 105-110).—This contribution is presented with a list of 64 references to the literature cited.

Continued passage of extra-erythrocytic forms of *Plasmodium gallinaceum* in the absence of erythrocytic schizogony, S. ADLER and I. TCHERNOMORETZ (*Ann. Trop. Med. and Parasitol.*, 35 (1941), No. 2, pp. 241-246).

The experimental use of organic sulfur compounds for the prevention of cecal coccidiosis in chickens, C. A. HERRICK, C. E. HOLMES, and D. L. DEGIUSTI. (Wis. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 6, pp. 117-127).—This is a further report of studies (E. S. R., 77, p. 546), confined entirely to *Eimeria tenella*, the cause of cecal coccidiosis. The results, details of which are given in tables, have shown that "Lorol" thiocyanate and tetraethylthiuram monosulfide when administered in single doses were effective in preventing the development of cecal coccidiosis in chickens. Continuous feeding of these chemicals under the conditions of these experiments proved unsuccessful. However, further research might disclose a satisfactory means of administration in the feed. Tetraethylthiuram monosulfide when administered in suitable dosages at the time of the administration of coccidia oocysts offers promise for developing resistance to coccidiosis in chickens. Further research is needed to develop a practical method of application of the chemical and the oocysts to produce resistance.

The effect of feeding concentrated physiological saline to chickens during cecal coccidiosis, S. H. WAXLER. (Wis. Expt. Sta.). (*Amer. Micros. Soc. Trans.*, 60 (1941), No. 4, pp. 453-460).—In the experimental work reported the rise in blood sugar that was apparent during cecal coccidiosis of chickens could be maintained at a lower level by feeding concentrated saline during the hemorrhagic phase of the disease. An appreciable drop in the increased blood sugar was obtained at its highest point by a single feeding of saline. There was a progressive and rapid increase in weight following the administration of saline. The marked increase in weight after saline feeding was considered to be due to increased water consumption.

A study of neoplastic disease in a flock of chickens, C. OLSON. (Mass. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 6, pp. 111-116, figs. 4).—Report is made of a study of a flock of 48 chickens purchased when 1 day old and raised in a yard where there had been no poultry for 4 yr. Neoplastic diseases were unusually common in the flock, 13 cases of tumor having been observed. The most common type was that involving lymphoid cells (lymphocytoma, 5 cases). There were 2 cases each of fowl leucosis, fibrosarcoma, and carcinoma. Neurogenic sarcoma (1 case) has not heretofore been described in the chicken. Fowl paralysis (neurolymphomatosis) did not occur in the flock. The 2 cases of fowl leucosis were reproduced in experimental chickens. Two cases of neoplasia of the lymphoid cell system furnished material suitable for attempts at experimental transmission. In 1 case the attempts were successful. The transmissible diseases reproduced in experimental birds were essentially similar to the diseases in the chickens from which the material was originally obtained. The results obtained would seem to indicate that different agents were responsible for the two types of transmissible neoplastic disease found in the flock.

Fowl paralysis (avian leukosis complex, lymphomatosis, range paralysis), W. J. HALL (*U. S. Dept. Agr. Cir.* 628 (1942), pp. 13, figs. 5).—A summary of the present knowledge of fowl paralysis and related leukemic diseases, presented in practical form.

Sulfanilamide therapy in enterohepatitis (blackhead) of turkeys, A. H. BRYAN (*North Amer. Vet.*, 22 (1941), No. 8, pp. 486-487).—The administration of 2 gr. of sulfanilamide per pound of body weight twice daily for 5 days, followed by 0.5 gr. per bird daily for the ensuing week, is reported to have been effective in the treatment of turkeys and peacocks affected with enterohepatitis.

Treatment of swine erysipelas with serum from a turkey infected with *Erysipelothrix rhusiopathiae*, J. E. LINDENMAYER and C. M.

HAMILTON. (Wash. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 100 (1942), No. 780, pp. 212-213).—The results obtained in the field on 22 birds from the use of formalized serum from a moribund turkey naturally infected with swine erysipelas, presented in table form, indicate that such serum might be of more value than one of swine origin.

AGRICULTURAL ENGINEERING

[**Agricultural engineering investigations by the Cornell Station**] ([*New York*] *Cornell Sta. Rpt.* 1941, pp. 91-92, 97).—Trials showing the superiority of the telephone type of petticoat insulator over three other types of insulating supports for electric fences are noted by H. W. Riley and R. O. Schlegelmilch; the development of a new type of electric incubator, by S. R. Cruz; cooperative tests of fencing, by Riley and B. A. Jennings, in cooperation with the American Society for Testing Materials, the National Bureau of Standards, and manufacturers of wire fencing; and a pick-up baler and haymaker (crusher), by H. B. Hartwig.

[**Agricultural engineering investigations by the Missouri Station**] (*Missouri Sta. Bul.* 438 (1941), pp. 19-20, 21-22, fig. 1).—These included studies of poultry housing; efficiency of tillage methods in growing corn, by M. M. Jones, R. P. Beasley, and L. Hightower; a portable sheep dipping tank, by J. C. Wooley and Jones; small combines, by Jones; and erosion control by thin section overfall structure and contour furrowing of permanent pastures, both by Wooley.

Surface water supply of the United States, 1938, part 2; 1939, parts 5, 10; 1940, parts 11, 12 (*U. S. Geol. Survey, Water-Supply Papers* 852 (1940), pp. VI+293, pl. 1; 875 (1941), pp. XI+405, pl. 1; 880 (1941), pp. VI+159, pls. 2; 901 (1941), pp. VIII+377, pls. 2; 902 (1941), pp. V+210, pl. 1).—These papers record measurements of stream flow, No. 852 covering the South Atlantic slope and eastern Gulf of Mexico basins, for the year ended September 30, 1938; No. 875 the Hudson Bay and upper Mississippi River basins and No. 880 the Great Basin for the year ended September 30, 1939; and No. 901 covering the Pacific slope basins in California and No. 902 the Pacific slope basins in Washington and upper Columbia River Basin, for the year ended September 30, 1940.

Watershed and hydrologic studies on the central Great Plains, J. A. ALLIS and L. L. KELLY. (*U. S. D. A.*). (*Agr. Engin.*, 22 (1941), No. 6, pp. 215-217, figs. 3).—This paper is confined mainly to a description of the experimental area and equipment of a U. S. D. A. Soil Conservation Service rainfall and erosion research station near Hastings, Nebr., selected as representative of the Central Great Plains region, especially with respect to (1) nature and extent of erosion, (2) general soil type, (3) predominant land use practices, (4) type of topography, and (5) major geologic formations. The soils, land use, and climate of the project are briefly discussed, as well as the objectives of experiments as (1) the effect of land use and soil conservation practices on run-off from small watersheds, (2) the effect of intensity of grazing and contour furrows on run-off from pasture land, (3) characteristics of flood run-off from agricultural areas of different sizes, and (4) the influence of land use on infiltration on natural watersheds. Data have been recorded for 2 yr.

Equipment for runoff measurements, A. L. KENNEDY. (*Tenn. Expt. Sta.*). (*Agr. Engin.*, 22 (1941), No. 6, pp. 218, 220, figs. 3).—A portable rain simulator, related equipment, and measuring devices are described. The run-off measurements were made on $\frac{1}{20}$ - to $\frac{1}{8}$ -acre plats under various conditions as to soil type, slope, cultivation, productivity, fertilizer treatment, and cropping systems. A belt-threading plow for laying two-ply cotton belting in the plow furrow to isolate selected plats for run-off studies was constructed, together with a floating rotary sprinkler designed to apply water automatically at a predetermined definite rate

on a square area when the line pressure is 12 lb. per square inch or more. The sprinkler in its operating position consists of a vertical supply tube and a distributor assembly that is free to rotate and move up or down on the tube. Water is supplied laterally to the distributor assembly through four equally spaced slots, or series of holes, near the upper closed end of the supply tube. This spacing of water passages varies the effective delivery pressure at the nozzles as the distributor rotates, resulting in the square pattern sprinkled from each head. As water pressure increases, the floating rotating head rises on the supply tube and proportionately reduces the effective area of the slots through which water passes to the nozzles, making nozzle pressure independent of line pressure above 12 lb. per square inch. Pumping units and other equipment are also described.

Proposed recommended practice for the design of concrete mixes, R. F. BLANKS ET AL. (*Jour. Amer. Concrete Inst.*, 13 (1942), No. 3, pp. 193-208, figs. 2).—A general procedure is outlined, an illustrative computation is given, and discussions by T. C. Powers, G. H. Larson, and W. H. Price are appended.

California experience with the expansion of concrete through reaction between cement and aggregate, T. E. STANTON, O. J. PORTER, L. C. MEDER, and A. NICOL (*Jour. Amer. Concrete Inst.*, 13 (1942), No. 3, pp. 209-236, figs. 7).—Use of high-alkali cement in conjunction with certain California aggregates caused distress in the resulting concrete whereas low-alkali cement gave no such trouble, and nonreactive aggregates showed no such effect with the high-alkali cement. Opaline silica was found to be one of the reactive aggregate components.

Acid-resistant concrete coatings, J. R. SPRAUL (*Agr. Engin.*, 22 (1941), No. 6, pp. 209-210).—Each coating was subjected to an accelerated acid flow test, using 0.2 N acetic acid and a maximum period of 10 days, and also to a test which involved drying a 2-in. cube of concrete, entirely coated, in an electric oven at from 75° to 85° C. for a period of 24 hr. This temperature was used because ensilage often approaches it. The cubes were then weighed, placed in beakers, and allowed to remain under tap water at room temperature for another 24 hr. The cubes were removed, weighed again, and the percentage of absorption was calculated. One day of the acid flow test as here used is considered equal to about 1 yr. of actual use unless the coating permits the adherence of the ensilage. Of 91 coatings tested in the laboratory, 24 were selected for testing by actual use in silos. For these 24 coatings the condition after 1 year's use, days of resistance to the acid flow test until first evidence of disintegration, and the percentage of water taken up in the water absorption test are tabulated. The 5 waxes were paraffin alone and paraffin with various adjuvants. These waxes were brushed on in the melted condition and further heated with a burner until only a thin film remained on the surface. Two asphalt coatings, 3 rubber-base paints, 11 resin varnishes, and 3 miscellaneous coatings were included in the silo tests.

The greatest advantage of waxes is their ease of application. Failures among the waxes are mostly due to high melting points and difficulty in applying the wax before it solidifies. Rapid solidification leads to brittleness and peeling, permitting disintegration to start. Good results were obtained with a mixture of paraffin and a softer, less brittle wax, such as the microcrystalline petroleum hydrocarbons. Asphalt coatings, in general, are very resistant to weak acids, but they often cause ensilage to adhere. Most rubber-base paints have high acid resistance, but the difficulty encountered in their use is the maintenance of a good bond between coating and concrete. A chemically resistant resin varnish containing chlorinated rubber usually gave good results. The resin penetrates the concrete and forms a good bond, while the chlorinated rubber at the same time gives toughness and extra resistance to the coating.

Observations on the durability of dry tamped silo staves, C. A. HUGHES and K. A. ANDERSON. (Univ. Minn.). (*Jour. Amer. Concrete Inst.*, 13 (1942),

No. 3, pp. 237-252, figs. 8).—Cubes cut from dry-tamped silo staves were subjected to durability cycles consisting of frost action alone or a combination of frost and acid action. It is concluded that the transverse strength and absorption are not adequate criteria of the durability of dry-tamped silo staves. Frost action was found the chief factor in silo durability, though acid action remains important because of its accelerating effect on the rate of disintegration in freezing and thawing tests. A procedure for a durability acceptance test is proposed.

Physical reactions of soil on plow disks, E. D. GORDON. (U. S. D. A.). (*Agr. Engin.*, 22 (1941), No. 6, pp. 205-208, figs. 7).—Measurements made under controlled conditions in the laboratory showed that soil type and conditions produce the greatest differences in soil reactions on the disks. Speed has been shown to exert a definite influence. The draft of a disk in a sandy loam soil was increased 67 percent with an increase in speed from 2.5 to 5 miles per hour. A disk angle setting of about 45° gave the minimum draft on the disk. The upward thrust on the disk was reduced as the disk angle was increased. This tended to improve soil penetration. Increased angle of inclination increased upward thrust on the disk, tending to lessen depth of penetration. The draft of disks and the upward thrust increased with increase in concavity. A slight difference in draft in favor of the large disk was observed, but when the disks were inclined from the vertical position the draft and penetration factors were reversed in favor of the smaller disk. A comparison of notched and plain-edge disks showed only slight differences in draft and ability to penetrate into the soil. When the disks were tipped back, however, the notched disk had the greater upward soil thrust.

Conserving soil and water with stubble mulch, H. H. BENNETT. (U. S. D. A.). (*Agr. Engin.*, 23 (1942), No. 2, pp. 37-38, 42).—"Stubble mulch" is defined as a process of protecting cultivated or bare land in such a way as to conserve soil and soil moisture and reduce evaporation through the use of a complete or partial surface covering composed of some form of crop stubble or residue. The primary process consists in merely stirring the soil with plows without moldboards to turn all the vegetation or vegetative litter under. It leaves much of the vegetable material—crop residue or vegetative litter—on the land as a surface protection against erosion. Comparing this treatment with that of basin listing, the author cites the observation at Lincoln, Nebr., that applying 2 tons of wheat straw per acre and plowing with a blade or winged implement a few inches beneath the surface, without turning the straw under, conserved 54 percent of the rainfall. Under comparable or duplicate conditions, only 20.7 percent of the rainfall was conserved with ordinary summer fallow and only 27.7 percent with basin listing, even though the basin listing permitted virtually no run-off, since the losses due to evaporation from the convoluted bare surface tended to offset the gains due to prevention of run-off.

Machinery requirements for farming through crop residues, F. L. DULEY and J. C. RUSSELL. (U. S. D. A. and Nebr. Expt. Sta.). (*Agr. Engin.*, 23 (1942), No. 2, pp. 39-42, figs. 16).—Pointing out advantages of the crop residue mulch, essentially the same as those brought out in the paper above noted, the authors discuss available implements for subsurface tillage, the cutting parts consisting of (1) V-shaped sweeps, (2) straight blades, and (3) toothed bar attachments for the rod weeder. The first of these devices had the advantages of cutting easily through roots and shedding them without fouling and of adaptability to operation at a relatively slight depth. Straight blades did not shed the roots or trash as well as blades that operate at an angle. Implements of the straight-blade type had, therefore, to be run at depths somewhat greater than are necessary with V-sweep machines, especially in loose or uneven ground. The tendency of trash to hang on the standards cannot be overcome so effectively by

the use of rolling coulters as is possible with the V-sweep type machines, since the straight blade does not open the kerf made by the coulters. A modification of this blade was, however, the toothed bar attachment for rod weeders, particularly well adapted to weeding and pulverizing the soil after one deep sub-tillage has been given. The rod weeder, even without the attachment, was a very valuable tool for later tillage operations after the first sub-tillage had been done with the attachment in place or with some other type of tiller.

As the subsurface tillage sometimes left the land either too loose or too cloddy, packers of various types were also studied. For packing alone, almost any type of roller or sprocket type packer could be used. For combined smoothing and packing, a device designated as a "treader" was used successfully. This implement is a rotary hoe, except that the wheels have been reversed so that the points enter the soil in a direction opposite to the conventional. It tends to tear apart large clods, packs the soil from below, and distributes but does not cover the residue.

A study of subsurface tiller blades, L. W. CHASE (*Agr. Engin.*, 23 (1942), No. 2, pp. 43-45, 50, figs. 9).—The author briefly indicates the surface conditions and cover desirable for subsurface tillage, defines ideal subsurface tillage, and discusses the design of the necessary implements, taking up actions of soil in passing over blade, angle of the blade, suction, overlap and offset, shanks, and independently hung or fixed sweeps. With reference to the last-named topic, the author prefers the independently hung sweep on the grounds that it permits a lighter shank, causes less breakage and lighter draft, and, when one sweep chokes and pulls out, it does not raise the entire machine. All subsurface tilling implements should be provided with coulters, preferably notched.

Equipment for subsurface tillage, H. A. MOREHEAD (*Agr. Engin.*, 23 (1942), No. 2 pp. 46, 64, figs. 3).—Devices similar in general principle to those discussed in the two papers above noted are described and illustrated.

Economic possibilities of farm mechanization, R. B. CORBETT (Md. Expt. Sta.). (*Agr. Engin.*, 22 (1941), No. 12, pp. 437-439).—The author notes farm income as the dominant factor, and points out the probability that it will increase with the current trend toward higher prices. The decreasing farm labor supply and the increase in the size of farms will also tend to increase mechanization. As checks to very rapid mechanization in the near future, the author sees rigid price fixing at low levels and difficulty in obtaining materials for the manufacture of the machines. Mechanization has to some degree been retarded by unnecessary special features, making the cost of farm mechanical equipment needlessly high, but in general the author believes the trend toward greater mechanization will continue.

Results of row spacing experiments with corn, E. V. COLLINS and C. K. SHEDD (Iowa Expt. Sta. coop. U. S. D. A.). (*Agr. Engin.*, 22 (1941), No. 5, pp. 177-178, fig. 1).—Higher yield of corn may be expected with closer row spacings, the optimum being single-stalk hills evenly spaced, with a planting rate suitable for the conditions. A 21-in. row spacing would require a tractor which can be adjustable to such rows, a special planter, and a special harvesting machine. A 30-inch. row spacing would give some increase in yield and the needed equipment is available, but the user would be limited to a single-row picker. A row spacing between 42 and 30 in. was not included in these experiments, and the authors do not consider the possible increased yield likely to be large enough to justify the change, except that an increased yield would be expected in the change from three-kernel hills at 42-in. check spacing to the same hills checked 36 by 36 in.

Horsepower requirements of power take-off driven combines, C. G. E. DOWNING (*Agr. Engin.*, 23 (1942), No. 2, pp. 47-50, figs. 12).—Although the power

take-off combine has been accepted as a standard implement for 10 yr., the power transmitted through the take-off appears not to have been measured. The author presents measurements for (1) a combine of the conventional type with an 8-ft. width of cut, a 24-in. rasp type rub bar cylinder, roller chain drives except a steel link chain reel drive, and V-belt drive to the shoe and straw walkers, mounted on two rubber-tired wheels and of a weight of 3,512 lb.; and (2) a high-speed type combine having a 5.5-ft. width of cut, a 5-ft. rubber-faced, angle-iron type cylinder, all V-belt drives except two short steel link chains, and reel ground-driven, this combine being mounted on two rubber-tired wheels and having a total weight of 2,730 lb.

The data obtained are plotted as brake horsepower to operate the combine through the power take-off against bushels per acre yield, brake horsepower per foot of width against yield, brake horsepower against pounds of crop through the cylinder per minute, etc.; as brake horsepower to propel tractor and combine on level land against miles per hour on hard, medium, and soft stubble land against percent grade, against yield, etc.; and in other relationships. The data showed a marked power consumption difference in favor of the first or conventional type of combine, and design features partially responsible for the differences are indicated. It was found also that some form of independent power take-off clutch is essential for satisfactory operation on rolling land.

Small electrically operated cross-cut saw, H. L. GARVER and P. G. MAY (U. S. Dept. Agr., Bur. Agr. Chem. and Engin., 1941, *ACE-114*, pp. 6, pls. 3).—A crosscut saw operated by a $\frac{1}{4}$ -hp. motor and satisfactory for logs of diameters up to 15 in. is described. Working drawings, bill of materials, assembly directions, and photographs accompany the brief descriptive text. The cost of this outfit, including the $\frac{1}{4}$ -hp. motor, was approximately \$25. It will cut wood as fast as two men with a crosscut saw and at the same time permit the operator to handle the logs and toss away the billets.

An insecticide dispersing machine, C. W. VEACH and W. E. McCAULEY. (Univ. Ill. and Ill. Nat. Hist. Survey). (*Agr. Engin.*, 22 (1941), No. 5, pp. 171-172, figs. 2).—The main parts of the machine described are an electrically heated metal cylinder, with concentric motor and fan below and a reservoir above, from which the insecticide or insecticide solution flows by gravity through a needle valve into a revolving distributor which throws the liquid against the grooved inside surface of the heated cylinder. The machine was more satisfactory than spraying devices principally in that there is a more efficient dispersion of an insecticidal chemical throughout a given space. There is no oily residue left over furniture and equipment because most of the diluting oils, which are necessary when dispersion is accomplished by mechanical spraying, are unnecessary with this type of machine. Other advantages are noted, and examples of successful use of the device are cited.

Machinery in peanut production, J. C. OGLESBEE, JR., and J. L. SHEPHERD. (Univ. Ga.). (*Agr. Engin.*, 23 (1942), No. 1, pp. 23-24).—Raking and burning of trash and sticks could be eliminated with saving of much humus if machinery suitable for adequate turning-under were available. A number of diggers of the plow type made to cut off most of the roots are satisfactory, the devices including special peanut points to be attached to the ordinary turning plow (the moldboard having been removed), potato diggers with elevators, etc. Improved digging machinery is desirable, however, especially a digger for use with the small farm tractor. Two picker types mentioned are the cylinder grain thresher type and a machine in which the peanut vines are drawn over a mesh through which the nut itself falls and is pulled from the vine. Some of these machines are satisfactory, but some leave many sticks and stems which lower the grade. Picking machine capacity averages about 3 tons per day.

Shelling castor beans, H. A. ARNOLD and M. A. SHARP. (Univ. Tenn.). (*Agr. Engin.*, 23 (1942), No. 1, p. 11, fig. 1).—It is believed that there is no machine for shelling castor-beans on the market. When sufficient pressure is applied on the sides of the pod to break it loose, the bean is usually injured, but by applying pressure on the ends of the pod the bean may be readily removed without cracking. The machine shown in an accompanying illustration consists of two 6-in. rubber disks, one stationary, the other rotating at about 1,100 r. p. m. These are spaced about 0.5 in. apart and so adjusted that the beans will just fit endwise between them without being crushed. Grooves cut in the rubber disks cause the pods to rotate in more than one direction. Pods which enter sidewise are turned so that the pressure comes on the ends.

An inexpensive, practical nursery harvester, V. C. HUBBARD. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 1, pp. 86–88, fig. 1).—This is a machine which one man can pull and at the same time actuate the sickle with a hand lever. With a crew of three men harvesting is accomplished as rapidly as with five men cutting by hand. The machine can be built at an approximate total cost of \$16. It can be turned in an 18-in. alley after removing the cradle, and in 3-ft. alleys with the cradle attached. All stems are cut at a uniform height above the ground. Few heads, even the small ones and those on short tillers, are lost in harvesting. There is little or no tendency to pull up shallow, loosely rooted plants when the straw is tough, but the harvester has not been tested in badly lodged grain.

Seed drier uses infrared electric lamps, J. E. NICHOLAS and H. B. MUSSER. (Pa. Expt. Sta.). (*Agr. Engin.*, 22 (1941), No. 12, pp. 421–423, 426, figs. 3).—The drier reported upon consisted essentially of a variable speed conveyor for the layer of seed and two rows of heating lamps, each made up of 20 infrared lamps of 250-w. rating with reflectors. Plow racks at 2-ft. intervals, each carrying multiple fingers which turned the seed as it passed, were also provided, together with a feed control gate, by means of which the layer of seed was kept $\frac{1}{4}$ in. thick. Static drying was also tested.

The experiments indicated that seed could be dried by infrared radiant energy to the safe storage moisture content of 10 percent or less in from 2 to 5 min. under static conditions. There was no appreciable injury to seed oven dried at 200° F. for various periods of time ranging from 3 to 30 min. A temperature of 200° by the use of a 250-w. infrared lamp was possible over a reasonable area. The capacity of the infrared seed drier and conditioner for specified speed and material was found to be for red fescue 160, for red clover 248, and for soybeans 369-lb. of seed per hour. Under the conditions of the test it was possible to reduce moisture content of the seed to a safe percentage with a 4-min. 50-sec. exposure. Germination tests of the dried seed showed that there was no appreciable injury to viability.

The influence of electric heating systems on sweet-potato storage house construction, G. H. DUNKELBERG. (S. C. Expt. Sta.). (*Agr. Engin.*, 22 (1941), No. 6, pp. 221–222, 225, figs. 3).—Stoves were found generally to fail to maintain desirable curing and storing temperatures uniformly. Electric heaters maintained curing and storage temperatures uniformly throughout the storage house, reducing shrinking and rotting to a minimum. The economical use of electricity in such a storage requires that the building be tight and well insulated, with positive ventilation controls.

Storage of grain sorghums, F. C. FENTON. (Kans. State Col.). (*Agr. Engin.*, 22 (1941), No. 5, pp. 185–188, figs. 7).—The author briefly outlines general principles involved in grain drying, presenting a combined chart of kafir and milo vapor pressures in relation to moisture content and temperature and atmospheric

vapor pressure as related to relative humidity and temperature, and pointing out that an atmospheric vapor pressure of from 0.05 to 0.10 lb. per square inch less than that of the grain is sufficient for effective drying by ventilation. Wind-ventilated bins operated by suction cupolas and by pressure cowls are discussed, together with three methods of air distribution for blower ventilation. The pressure cowl gave the most effective wind ventilation, and a commercial 500-bu. bin for wind ventilation was effective at the Fort Hays Experiment Station. Such ventilation could not be depended upon, however, for excessively damp grain in warm weather. For the use of the forced ventilation system, the importance of selecting times for operation when the vapor pressure differential is high or the grain heating is emphasized.

Snow increases the moisture content of grain. T. E. LONG (*North Dakota Sta. Bimo. Bul.*, 4 (1942), No. 3, pp. 18-19, figs. 2).—In 14 bins of 20-bu. capacity in which the wheat content of 7 was covered with building paper and that of the other 7 left uncovered, there was an average increase of 1.7 percent moisture content in the uncovered wheat from February 3 to March 3, 1939. During this same period the covered wheat showed an increase of only 0.3 percent. The walls, bottoms, and roofs were all tight in these bins, and the only place that snow could enter was under the eaves of the roof. Sealing of all joints with a caulking preparation is a suggested remedy. Points of entrance especially mentioned are the rib of the roof, the door, and the top edge of the side wall. Any snow collecting on the building paper covering should be removed.

An economic analysis of large and small grinding units for dairy farms. I. P. BLAUSER. (Ohio State Univ.). (*Agr. Engin.*, 22 (1941), No. 6, pp. 226, 230, fig. 1).—Selection of proper feed grinding methods and equipment can often make feed grinding on the farm a profitable operation, although some farms may use such a small amount of ground feed that operating even the smallest grinder may cost more than custom grinding. Few dairy farms in Ohio will need larger than a 3-hp. unit unless they use corn and cob meal in the ration. Cost and yearly overhead charges for complete grinding units of from $\frac{1}{2}$ to $7\frac{1}{2}$ hp. are tabulated, and a graph shows the relation of cost in cents per 100 lb. and tons ground per year for $\frac{1}{2}$, 1, 2, 3, 5, and $7\frac{1}{2}$ -hp. units.

Studies of barn-dried hay. W. E. HUDSON. (Univ. Ga.). (*Agr. Engin.*, 22 (1941), No. 5, pp. 170, 172).—The drying system consisted of a 5-hp. electric motor, a centrifugal type blower, and a system of air ducts laid on the mow floor. The air ducts were 8 in. high and 10 in. wide, spaced approximately 5 ft. on centers, extending to within 5 ft. of the sides of the mow, and provided with a $\frac{3}{4}$ -in. space between the lower edge of these ducts and the floor. A central duct built tight to the mow floor fed the air from the blower to the smaller laterals. No heating of the air was provided, but a humidistat was used to cause operation of the blower at low relative humidity only, except when heat removal was needed. The maximum depth of the green hay was 10 ft., three cuttings being stored in successive layers. The alfalfa used in this trial had a standing moisture content of from 60 to 70 percent, which fell to from 25 to 50 percent during 1 day in the field. None of the hay cured in the barn stayed in the field overnight.

For 60 tons cured in 2 years' work, average power consumption was 41.5 kw.-hr. of electricity per ton. This figure could be lowered to below 40 kw.-hr. by better operation and design. Often the majority of the hay was overdried in an effort to cure small spots where air flow was poor. The barn-dried samples from the first test graded U. S. No. 2, with an average color rating of slightly over 50 percent. The field-dried samples were U. S. No. 3, with a color average of less than 20 percent. Values of 40.1 mg. of carotene per kilogram of barn-dried hay and 8.7 mg. per kilogram for the field-cured hay were found. Some higher grades and values were obtained in the second year's work.

Results of barn hay drying studies, J. W. SJOGREN and P. D. RODGERS. (Va. Expt. Sta.). (*Agr. Engin.*, 22 (1941), No. 6, pp. 219-220).—A barn drier consisting essentially of a blower housed in a shed at the side of the mow and air ducts on the mow floor produced under very unfavorable weather conditions a mixed hay judged by farmers to be No. 2. Similar equipment with an air-heating system of 900 sq. ft. of radiation in the duct supplied from a hot-water furnace of 3 sq. ft. grate area produced hay of premium price quality under weather conditions unfavorable through an entire haying season for curing in the field. The heated air drier had a double-fan blower driven by a 5-hp. motor. A water temperature of 160° F. raised the temperature of the air from the delivery duct to about 20° above that of the atmosphere. This drier was operated on an average of 10 hr. per ton of dried hay, requiring an average of 42.8 kw.-hr. and 240 lb. of coal per ton of hay dried. With electricity at 3 ct. per kilowatt-hour and coal at \$2 per ton, the power and fuel cost for drying with artificial heat was \$1.53 per ton. The hay produced sold for \$25 per ton, a premium of \$5 per ton above the market.

Cooling eggs on the farm and at grading stations: A progress report, J. W. WEAVER, JR., R. L. BRYANT, and C. ROGERS. (Coop. Va. Expt. Sta. et al.). (*U. S. Dept. Agr., Bur. Agr. Chem. and Engin.*, [1941], ACE-104, pp. 10, pls. 6).—Eggs held in experimental coolers prior to semiweekly shipment from the farm showed net increases in selling price of from 32 to 78 ct. per case over similar eggs furnished not cooled. Precooling eggs for 45 min. in a wire basket before storing them in cases in the coolers gave 2.3 percent more extras than did no precooling. Loss in egg quality during shipment amounted to 80 ct. per case for eggs held at room conditions and from 21 to 50 ct. per case for eggs held in the coolers. Fresh laid eggs shipped in precooled cases from the coolers brought a net selling price of 20 ct. per case more than that received for similar eggs shipped in cases not precooled. Cases containing flats and fillers will absorb 0.6 lb. of water while in the coolers 7 days, and this water is later available to provide moist air around eggs en route to market. At a mean ambient temperature of 74° F. the critical point of ambient relative humidity between high- and low-quality eggs appeared to lie between 65 and 75 percent. The construction and performance of two experimental coolers are briefly discussed.

Electrolytic heater for incubators, S. R. CRUZ. (Cornell Univ.). (*Agr. Engin.*, 22 (1941), No. 6, pp. 211-214, figs. 7).—The heater described consists essentially of two electrodes of monel metal surrounded by glass tubes and immersed in a dilute solution of sodium hydroxide, one of the electrodes being fixed while the other is raised or lowered within its glass tube by an arm actuated by the expansion or contraction of a thermostatic mechanism of the bellows type. The current passing through the solution is therefore gradually and continuously increased or decreased with the fall or rise of the temperature of the thermostat instead of being cut off entirely at a set maximum temperature and renewed at full capacity at a fixed minimum temperature. Temperature control to within 0.5° F. was obtained, together with moisture for the incubator atmosphere from the heating element itself, and a supply of oxygen which was experimentally shown to be advantageous.

A poultry ventilation problem, M. W. EMMEL. (Fla. Expt. Sta.). (*Agr. Engin.*, 22 (1941), No. 12, pp. 435-436).—The author finds that hemocytoblastosis, which is induced by inadequate ventilation in broiler and fryer plants, leads to lowered resistance to infection, reduced growth rate, poor feathering, and lack of uniform growth. Mortality is frequent in broiler and fryer plants in which ventilation is grossly inadequate. It would appear that an indoor-battery plant requires forced ventilation.

Oklahoma houses for laying hens, R. B. THOMPSON (*Oklahoma Sta. Bul.* 253 (1942), pp. 31, figs. 21).—Following a brief discussion of such general require-

ments as adequate ventilation, sunlight, suitability of size and location, etc., this bulletin presents bills of materials, working drawings, and some notes on constructional detail for the building of a 20- by 20-ft. even-span. straw-loft house and of a shed-roof house. Suggestions for the improvement of unsatisfactory structures already in existence are also given.

An inexpensive laying-house floor of wire supported by peeled pine poles, H. D. POLK (*Miss. Farm Res. [Mississippi Sta.], 5 (1942), No. 2, p. 5, figs. 3*).—The author describes briefly the construction of the type of floor named for a house 12 by 24 ft., emphasizing that such a floor should lie 18 in. at least above the ground level. He also points out that 16-gage 1-in. mesh netting should have more than double the durability of the cheaper and more commonly available 20-gage netting, and the bill of materials given calls for the heavier wire for the flooring. A cost of \$8.23, exclusive of the labor cost for cutting and preparing poles and laying the floor, is estimated.

New approaches to farmhouse design, construction, and equipment, J. W. SIMONS. (U. S. D. A.). (*Agr. Engin., 22 (1941), No. 5, pp. 181-184, figs. 2*).—The addition to a wood floor and joist system supported on piers of curtain walls between the piers reduced fuel consumption by from 12 to 19 percent. Concrete slab floors laid on gravel fills on the ground gave temperatures much more nearly uniform than did wood floors of the type above noted. Caulking of exterior sliding joints and cracks about doorways and windows, together with weather stripping of doors, effected fuel savings of from 23 to 39 percent in the region (vicinity of Athens, Ga.) in which the experiments here noted were carried out. Wall construction in relation to climatic conditions, kitchen comfort problems, and heating equipment to meet cost and farm fuel requirements are among other topics similarly dealt with.

Case studies in low-cost housing, D. G. CARTER. (Ark. Expt. Sta.). (*Agr. Engin., 22 (1941), No. 12, pp. 427-428, figs. 3*).—This paper summarizes nine case studies in low-cost housing conducted at the station from 1934 to 1941. Each case represents a new farmhouse, built from plans of the station, for which complete labor, material, and cost records were kept and the construction supervised. A primary objective was cost reduction, principally through the utilization of native materials and unskilled labor. Certain of the studies also tested the value of special construction methods and the effectiveness of technical aid and educational help in cost reduction. The part of total costs representing labor and materials, respectively, and percentages of skilled and unskilled labor are among the data tabulated.

Absorptive form lining, E. N. VIDAL and R. F. BLANKS (*Jour. Amer. Concrete Inst., 13 (1942), No. 3, pp. 253-268, figs. 14*).—The authors describe briefly laboratory investigations of the use of the wallboard type of absorptive form lining, field tests to determine the practicability of the method, purchase specifications, and experiences in using absorptive form lining in actual construction.

Classification of house and barn paints as recommended by the United States Department of Agriculture, F. L. BROWNE. (Coop. Univ. Wis.). (*U. S. Dept. Agr., Tech. Bul. 804 (1942), pp. [4]+37, fig. 1*).—This bulletin describes, primarily for paint technicologists, a system of classifying paints by groups, types, and grades which is the result of many years of research by the Forest Products Laboratory on the painting of wood. It is pointed out that adoption of this system by manufacturers will allow a decided simplification of the technical statements on paint-container labels, and will make it possible to tell paint users more clearly and effectively how to identify the many kinds of paints on the market, what the characteristics of each kind of paint are, and how each should be applied and maintained.

Lightning protection installation on shade trees, O. F. WARNER (*Arborist's News*, 6 (1941), No. 5, pp. 33-36).—The author outlines basic principles of tree protection paralleling those of building protection, specifies materials found satisfactory, and gives detailed instructions for installation. For the main conductor he recommends a cable of eight strands, each consisting of four No. 16 American wire gage wires of pure, soft-drawn copper, the cable being easier to attach to the tree if rope lagged rather than braided. This cable is about $\frac{7}{16}$ in. in diameter and weighs 200 lb. per thousand feet. For the air terminals, 8 in. of the end of the cable with the wires spread to form an inverted cone is preferable to specially designed points. Ground rods of $\frac{5}{8}$ in. copper-clad steel at least 6 ft. long are specified. All metal work in or near the tree is to be connected into the grounded system.

Activities in fire prevention and protection, H. GIESE. (Iowa State Col.). (*Agr. Engin.*, 22 (1941), No. 6, pp. 230, 238).—Prevention of fires is an engineering problem requiring first, a systematic study of the factors involved, and second, a program of education and inspection. An analysis of more than 20,000 rural fires in Iowa covering a 10-yr. period shows that, where the cause can be identified, a relatively few preventable causes are responsible for a large percentage.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics by the Missouri Station]. (Partly coop. U. S. D. A.). (*Missouri Sta. Bul.* 438 (1941), pp. 12-15, 16-19).—Results not previously noted are reported as follows: (1) Brief findings in a farm cost accounting and cost of family living on farms study by B. H. Frame on 102 farms located in the Big Creek watershed in Harrison County, Mo., and in Decatur and Ringgold Counties, Iowa; (2) a table based on a study by Frame on the utilization of labor on farms in 8 counties of the State showing by farm operations the type of power used and the average acres handled per 10-hr. day, per man and per horse; and (3) a table by Frame showing for 11 Nodaway County farms averaging 146.2 crop acres the average number of pieces of different kinds of crop equipment per farm, the average value per piece, the average crop acres per piece, and the average value per crop acre.

[Investigations in agricultural economics by the Cornell Station, 1940-41] (*[New York] Cornell Sta. Rpt.* 1941, pp. 76-87, 176-177).—Included are some brief findings not previously noted on the following studies: (1) The organization of up-State milk markets, by L. Spencer and G. Bishop; (2) changes in demand for milk, cream, and evaporated milk in the New York metropolitan area, by Spencer and C. J. Blauford; (3) adjusting the milk supply for the New York market, by Spencer and A. J. Pollard; (4) fruit marketing, by F. A. Harper, W. E. Black, and F. E. Stanley; (5) apple yields and sales, by G. P. Scoville; (6) cost of producing cherries, by Scoville, H. F. DeGraff, and H. Azarlah; (7) an economic study of the factors affecting the operation of farmers' country fruit and vegetable auction markets, by M. P. Rasmussen and E. W. Cake; (8) an economic study of New York State regional markets, by Rasmussen and V. H. Nicholson; (9) an analysis of inspections of potatoes sold in retail stores in up-State cities of New York and (10) a study of relationship of varieties, grades, costs, and margins to prices received for potatoes by growers and handlers, both by Rasmussen and P. J. Findlen; (11) the business of farming in Tompkins County in 1907, 1917, 1927, and 1937, by E. G. Misner and P. A. Henderson; (12) farm-management study of Livingston County, 1909, 1919, 1929, and 1939, by S. W. Warren and C. A. Becker; (13) farm tenancy in New York, by Warren and P. L. Poirot; (14) a study of farm cost accounts on New York farms, by P. S. Williamson, A. J. Hangas, and R. G. Latimer; (15) a farm-management

study of dairy farms with special emphasis on the seasonal costs and returns in milk production, by L. C. Cunningham and I. R. Bierly; (16) marketing dairy cow replacements in New York, by W. M. Curtiss; (17) rural relief administration and financing in New York, by M. P. Catherwood, C. A. Bratton, and E. A. Lutz; (18) governmental costs and taxes in rural New York, by Catherwood and Bratton; (19) foreign trade and agriculture and (20) World War II and prices of dairy feeds, both by F. A. Pearson and W. I. Myers; (21) price level and prices of feed, by K. R. Bennett; (22) currency depreciation and prices, by C. van der Merwe; and (23) vegetable handling and storage, by H. Platenius.

Current Farm Economics, [February 1942] (*Oklahoma Sta., Cur. Farm Econ.*, 15 (1942), No. 1, pp. 1-40, fig. 1).—In addition to the usual discussion of the agricultural situation, the usual tables of indexes, etc., a statement of the revised agricultural production goals for 1942, a description and discussion by G. P. Bollins of "Parity Price" (pp. 10-17), and articles by W. E. Grimes (Kans. State Col.) on What Happened to Farmers' Cooperatives During and After World War I (pp. 18-27) and by P. Nelson on An Appraisal of Changes Since World War I That Affect the Present and Future of Cooperatives (pp. 27-35) are included.

Systems of farming for the Central Bluegrass region of Kentucky, W. D. NICHOLLS, G. B. BYERS, and J. H. BONDURANT (*Kentucky Sta. Bul.* 419 (1941), pp. 265-319).—"From a study of 375 detailed cost and income records taken on representative farms in the Central Bluegrass area of Kentucky supervised by experiment station staff members during the period 1921-40, the relative profitability of several farming systems (combinations of crop and livestock enterprises) on farms of different acreages was examined. From these cost and income records were derived the standards of costs and yields in crop and livestock production used in calculating the relative profitability of the different farming systems. Four of the successful farms, differing both in size (48, 94, 155, and 287 acres, respectively) and in systems of farming, were selected as samples, and budget calculations on the basis of the production standards were made for both the systems actually followed on those farms and various alternative systems common in the area. The calculations were made at low, medium, and high levels of prices for farm products. The 'low' price level was based on tobacco at 10 ct. a pound and other products at corresponding figures, the 'medium' price level on tobacco at 15 ct. a pound, and the 'high' price level on tobacco at 25 ct. a pound."

The income of tenant-operators and landlords on 155-acre farms with a medium level of price, a special study of a farming system that will reduce erosion to a minimum while providing a relatively high income, and size of farms and price levels as related to profitability of farms are also discussed.

Arizona agriculture, 1942: Supplies, prices, and income, G. W. BARR (*Arizona Sta. Bul.* 178 (1942), pp. 365-388, figs. 7).—Data are assembled and discussed for prices of farm products and their relation to parity price, cash income from farm and ranch production in 1940 and 1941, acreages and production of different crops by counties in 1941, and payments in 1941 under the agricultural conservation and parity programs. The production, prices, etc., of different crops and the possibilities of increased production to meet war needs are described and discussed.

Ranch organization and operation in northeastern Nevada, G. A. CAMPBELL, M. CLAWSON, and C. E. FLEMING. (Coop. U. S. D. A. et al.). (*Nevada Sta. Bul.* 156 (1941), pp. 81, figs. 11).—"In 1937, at the request of the Nevada State Farm Bureau, an inventory of range and ranch resources of northeastern Nevada and a study of their utilization was undertaken cooperatively by the agricultural experiment station and agricultural extension service of the State of

Nevada; by the Grazing Service, Fish and Wildlife Service, and Office of Indian Affairs of the Department of the Interior; and by the Farm Credit Administration, Forest Service, Soil Conservation Service, Agricultural Adjustment Administration, and Bureau of Agricultural Economics of the Department of Agriculture."

This bulletin reports one of the studies, the specific objectives of which were "to ascertain types of ranch organization and management practices on ranches in the area; to measure incomes secured by various types of ranches and to analyze differences in income between different livestock enterprises; to suggest ways in which more efficient and profitable organization of ranches might be evolved; and to measure the income to land on different sizes and types of ranches and to contrast this income with the amounts actually paid for the use of land of different types in order to lay the foundation for changes in grazing fees, taxes, and other land costs if this seemed desirable." Data on ranch organization and operations in 1937 were obtained in a survey made in the spring of 1938 of 83 cattle, 13 sheep, and 9 "mixed" ranches and 13 "other farms." The natural conditions of the area and the general conditions in 1937 are briefly described.

The average cattle ranch in 1937 operated 1.1 acres of cropland and 6.1 acres of all types of land per animal unit. The average net turn-off for beef was 231 lb. per head in the breeding herd. It increased 24.5 lb. for each 10-percent increase in calf crop and declined 5.5 lb. for each 1-percent increase in death loss and 1.3 lb. for each 100-head increase in the size of the herd. Each 10-percent increase in "net" lamb crop increased the production of lamb and mutton 7.3 lb. per head in the breeding flock. The average cattle ranch required 2.1 man-days of labor per animal unit. The labor per animal unit decreased as the number of livestock increased to 400 animal units and then gradually declined. Labor cost was largest, followed by land costs, depreciation, parts and supplies, and feeds. Taxes amounted to nearly 50 percent of the total land costs if interest is excluded. The cost of leased land was nearly 25 percent of the total land costs. Costs of renting land varied from 41 to 55 ct. per animal-unit month. There was no correspondence between the cost of land per ranch and the income secured from the land.

"The marked divergences between cost of land and income from land, and the great variations in each, create serious problems for the rancher, the public land administrator, the loan agency, and others.

"As a result of this study, several suggestions can be made for increased income and lowered costs. Income can be increased by seasonal breeding, reduction in death loss, improved selling practices, improved pasture and hay production, and increased use of supplemental enterprises. Costs can be lowered by increased efficiency in use of labor, by more careful use and repair of machinery, and by more careful planning of auto and truck travel. Since native range grasses and other forage are the cheapest feeds, their maximum use consistent with adequate feed supply and good livestock management is recommended. Avoidance of overcapitalization and excessive indebtedness is essential for success in ranching."

Sheep migration in the Intermountain Region, H. R. HOCHMUTH, E. R. FRANKLIN, and M. CLAWSON (*U. S. Dept. Agr. Cir. 624* (1942), pp. 70, map 1, figs. 20).—The statistical data were obtained from the 1938–39 sheep permits and licenses of the U. S. D. A. Forest Service and Grazing Services and Office of Indian Affairs of the U. S. Department of the Interior. "Information on operating methods, forage conditions, erosion, water supplies, and miscellaneous items of the grazing areas and major driveways was gained from extensive field observations."

Only the sheep which were permitted or licensed in 1938-39 to graze on public lands are included. The importance of sheep in the region, the grazing areas, the seasonal ranges, the sheep migration resulting from seasonal ranges, the operating methods, the management practices, and cattle v. sheep on the range are described. The problems and responsibilities of landownership, where sheep move in the Intermountain Region, and the opportunities for improving the use of forage resources are discussed.

Experience of some Iowa farmers with cattle feeding, J. A. HOPKINS and R. B. ELWOOD (*Iowa Sta. Bul. P35, n. ser. (1941), pp. 189-216, figs. 6*).—Information is presented on the more common methods used by Iowa cattle feeders. The study is based on records for 388 lots of cattle fed on 221 farms during the 2-yr. period beginning in the fall of 1937. Cattle feeder's problems, the information needed by feeders, and cattle-price trends and the feeding program are discussed. In comparing feeding practices, the following subjects are discussed: Dry-lot v. pasture feeding, weight of feeders and length of feeding period, variations in the amount of roughage and in the protein content of rations, silage feeding, heavy v. light feeding, and feed costs in fattening heifers.

Cost and profit of ginning cotton in Texas, W. E. PAULSON (*Texas Sta. Bul. 606 (1942), pp. 103, figs. 11*).—"This bulletin presents a comprehensive analysis of the cotton ginning business in Texas, with especial emphasis on costs and profits. It has been prepared primarily for students of the ginning business. The controlling influence of volume of ginning and investment in the gin plant on the cost and profit of ginning is analyzed. The distinct parts played by fixed cost and by variable cost in the cost and profit of ginning are depicted. Factors underlying the success of an individual ginner are developed. The fundamental aspects of a successful ginning business in Texas are revealed."

One section of the bulletin, prepared primarily for persons interested in the practical use of cost and profit analysis, provides for computing standard costs and profits by the use of tables of cost and of "break even" volumes. In cooperation with the U. S. D. A. Farm Credit Administration, cost records were procured by extensive field trips in 1934 and 1936 on cooperative gins operating in the State. Later records were obtained from the Houston Bank for Cooperatives.

Producing peanuts for war needs (Sumter County, Georgia), J. C. DOWNING, R. TERRY, and W. E. HENDRIX. (Coop. U. S. D. A.). (*Georgia Sta. Cir. 135 (1942), pp. 12*).—Information is given to assist farmers in meeting the 1942 production goals for peanuts. Cultural practices; labor requirements; returns from peanuts for oil; available land; the obtaining of equipment, seed, and operating capital; etc., are discussed. Plans for reorganizing a medium-sized cotton-peanut farm to meet war needs are outlined.

The potato enterprise in Garrett County, Maryland, A. B. HAMILTON and S. H. DeVULT (*Maryland Sta. Bul. A4 (1941), pp. [2]+91-122, figs. 8*).—Detailed information for the crop years 1936 and 1937 was obtained by the survey method on farms selected at random throughout the county. Personal visits were made to 103 farms in 1937 and to 113 in 1938. Records were also obtained in markets in the county where the potatoes were sold. The physical features of the county are described. An analysis is made of the size of the farms, capital invested, crops grown, and livestock produced. Data are presented as to the trends in acreage, yield, and prices of potatoes; varieties grown; income; etc.

The average size of the farms in the county was 184 acres, of which 64 acres were in crops. The average acreage of potatoes was 4.9 acres, and the average yield was 28 bu. per acre. The average cost of production for the 2 yr. was \$90.89 per acre, or 43.7 ct. per bushel. The total income averaged \$164.43 per

acre, or 79 ct. per bushel. The net return was \$73.54 per acre, or 35 ct. per bushel. The average labor requirement was 120.7 man-hours per acre. The study indicated that a yield of 155 bu. per acre is necessary before the farm shows any net profit. Farms with over 6 acres of potatoes in general showed proportionately less profit than farms having from 4 to 6 acres of potatoes.

Life, service, and the cost of service of farm machines on 400 Iowa farms, J. B. DAVIDSON and S. M. HENDERSON (*Iowa Sta. Bul. P37, n. ser. (1942), pp. 281-299, figs. 4*).—In cooperation with the Iowa Agricultural Extension Service, the authors obtained data, supplementing an early study (E. S. R., 61, p. 881), from farmers quite uniformly distributed over the State. The average life of different types of machinery, the influence of housing on the life of machines, obsolescence, cost of repairs, annual number of days of use, the life of electric motors, depreciation, interest, insurance, taxes, and other costs are summarized and discussed.

Can agricultural engineers solve tenant problem? R. E. HAYMAN (*Agr. Engin., 22 (1941), No. 6, pp. 223-225*).—This is mainly an economic discussion. The author considers tenancy not necessarily an evil and owner operation not a solution. Owner-tenant contracts drawn to meet the specific local conditions may be of great benefit both to the owner and to the tenant. An example is detailed. Because the problem is one of the organization and application of men and machines to natural conditions and materials, to produce or construct the desired commodity, the author believes that the agricultural engineer will finally solve this situation between tenants and owners of farms if a solution is to be reached.

Legal aspects of farm tenancy in Kentucky, H. A. HOCKLEY and W. D. NICHOLS. (Coop. U. S. D. A.). (*Kentucky Sta. Bul. 418 (1941), pp. 237-264*).—The objectives of the study were "to determine the manner in which customs and legal procedures affect the relationships between landlords and tenants, to discover shortcomings that may exist in present laws, to outline tentative suggestions whereby these shortcomings might be corrected, and to make this information available to the people of Kentucky as a basis for improving the system under which farms are rented." Following the preparation of a summary report of existing laws (references to which are given) and appellate court decisions, the authors interviewed judges, lawyers, landlords, tenants, and others to obtain information regarding the interpretation, operation, administration, and effects of the laws and decisions on tenancy relationships. The security of tenure (leases and evictions of tenants), conservation, and improvements (repairs, improvements, and waste and deterioration), collection of rents and advances (prior rights of landlords, enforcement of liens, and results of collection procedures), and the settlement of disputes by arbitration are discussed. Suggestions are made for the improvement of landlord-tenant relations. An appendix summarizes British experience in developing tenure laws.

Farm tenancy in Box Butte County, Nebraska, G. H. LAMBRECHT and L. W. WALLIN. (Coop. U. S. D. A.). (*Nebraska Sta. Bul. 336 (1942), pp. 28, figs. 6*).—This study was made to provide information for use in land planning in the county. It is based on data obtained for 302 farm operators selected at random and 47 landlords. The first part—the tenancy situation—deals with the increase and prevalence of tenancy, the characteristics of operators and landlords, the mobility of operators, living conditions, community life, and the lands and improvements. The second part discusses the availability of farms, the attitudes of landlords, the limitations of tenants, and leasing arrangements. The third section suggests some possible adjustments that might be made.

Tenancy in the county increased from 6 percent in 1890 to 53 percent in 1940. Thirteen percent of the tenants studied had occupied their present farms only 1 yr. and 50 percent for only 4 yr. or less. Forty-one percent of the tenants were dissatisfied with their present cropping system. Forty-six percent of the unrelated landlords reported that it is difficult to secure tenants with ability. Sixty-six percent of the leases were written, and 74 percent were for only 1 yr. Of the tenants, 7 percent preferred 1-yr. leases and 93 percent leases for 3 yr. or more. Twenty-eight percent of the landlords were willing to lease for more than 1 yr.

Farm tenancy in Clay County, Nebraska, L. F. GABBY, G. H. LAMBRECHT, and F. MILLER (*Nebraska Sta. Bul.* 337 (1942), pp. 24, fig. 1).—The data presented were obtained from the reports of the U. S. Bureau of the Census, farm account records, and a survey in 1939 of farms operated by tenants and part-owners. The amount of tenancy in the county, the age and farming experience of the tenants, the leasing arrangements, the rental rates, the distribution of investment and expenses between landlords and tenants, the cropping systems and the numbers of livestock on the farms, the division of income between landlords and tenants, the mobility of tenants, etc., are analyzed.

In 1940, 56.5 percent of the farms of the county were operated by tenants. The average investment in farm business during the period 1930–39 was \$18,545, of which 14 percent was contributed by the tenants. During the period, the receipts less business expenses averaged \$874 per farm, of which the operators received \$593 and the landlords received \$281. The landlords received 1.8 percent return on their investments. "The tenants' share of the farm income averaged \$134 more than the returns would have been to owner-operators with mortgages of 75 percent of the reported value of land and buildings." The tenants remained on the same farm an average of 10.5 yr.

Farmers' mutual fire insurance in Maryland, P. R. POFFENBERGER, S. H. DEVAULT, and G. H. GOLDSBOROUGH (*Maryland Sta. Bul.* 45 (1941), pp. [3]+123–144+[2], figs. 5).—The data used in this study were obtained from the offices of the 16 companies in operation by use of questionnaires and from the records in the office of the insurance commissioner of the State. The location, development, organization, income, and expenditures of the companies; the factors influencing fire losses; the types of policies; and the companies' practices as to classification of risks, inspection, reinsurance, joint or concurrent insurance, etc., are described and discussed. Tables and charts show the net insurance in force by years from 1930 to 1939, the sources of income and expenditures by items of the mutual companies, the reserve ratios and efficiency ratios by years, and the causes of fires in 1939.

Of 16 companies, 12 were advanced premium companies and 4 assessment companies. The total average income, 1930–39, averaged 50.9 ct. per \$100 of insurance in force, of which approximately 43 ct. was from net premiums. The total expenditures averaged 45.6 ct. per \$100 of insurance, and 5.3 ct. was added to the reserve. Fire losses constituted approximately 49 percent of the total expenditures; salaries, fees, and agents' compensation, about 30 percent; and losses on investments, about 10 percent. "In 1939, the average reserve for all companies was 1.06 percent of net insurance in force. . . . The loss ratio (percent losses paid is to premiums) averaged 52, and the expense ratio (percent expenses other than losses is to premiums) averaged 54 for the 10-yr. period 1930–39. In 1939 the same ratios were 50 and 46."

Changes in the prices of apples and other fruits, M. D. WOODIN ([*New York*] *Cornell Sta. Bul.* 773 (1941), pp. 25, figs. 26).—This study was made to determine the causes of changes of apple prices over a period of years, from

one year to the next, and within each season. "In New York, apples are selling at about the same price now as they were 50 yr. ago, in relation to the prices of other commodities." Year-to-year changes in apple prices are caused mainly by changes in the price level of all commodities and by changes in the size of the apple crop. Apple prices tend to move in cyclical swings averaging about 10 yr. in length. Part of these swings are accompanied by swings of comparable length in production. The apparent cause of the remainder of the swing was not found. Seasonal rise in apple prices is greatest when the price level of all commodities is high. High-priced varieties rise more than low-priced ones. Size of the crop has little effect on the seasonal price changes. The range in price for any day is usually wide. Changes from day to day apparently are not related to the day of the week or to holidays. Price trends indicate that some varieties have gained in popularity and others have lost over a long period of years. "The demand for most fruits is elastic. Peaches have the most elastic demand. The demand for apples is slightly elastic. Oranges and grapefruit appear to have an inelastic demand."

The net return to growers is slightly greater for large than for small apple crops. "Prospects are favorable for apple prices to rise during the next few years, judging from the analysis of causes of past change. This prospect is based on the assumption that (1) the commodity price level will be stable or rising, (2) average apple production will be at present levels or less, (3) further increases in citrus production will continue to have no very harmful effects on apple prices, and (4) although there may be a downswing of the cyclical type in apple prices to a low around 1945 or 1946, the amount of downswing probably will be more than offset by factors in prospect favorable to apple prices."

North Dakota farm prices, W. L. ETTESVOLD (*North Dakota Sta. Bimo. Bul.*, 4 (1942), No. 3, pp. 30-31).—Data through December 15, 1941, are summarized.

RURAL SOCIOLOGY

War came to the Iowa community, C. A. ANDERSON and B. RYAN. (Coop. U. S. D. A.). (*Iowa Sta. Bul. P36, n. ser. (1942), pp. 217-280, figs. 7*).—This bulletin tells the story of community life in Iowa during the World War of 1917-18 and makes suggestions for preparing for the present war emergency.

Volume and characteristics of migration to Arizona, 1930-39, V. FULLER and E. D. TETREAU. (Coop. U. S. D. A. et al.). (*Arizona Sta. Bul. 176 (1941), pp. [4]+295-327, figs. 3*).—In January 1940 there were approximately 134,000 people living in Arizona who had moved in from other States during the 10 yr. 1930-39. About 101,000 people who were living in Arizona in 1930 moved to other States during the same period. Between 1930 and 1940, according to U. S. Census figures, Arizona's population grew from 435,573 to 499,261, or an increase of 63,688 persons. Natural increase (excess of births over deaths) and migration each accounted for about one-half of this growth. Nine-tenths of the migrants were whites, 6 percent were Mexican, and 4 percent were Negroes. About one-third of the migrants had previously been engaged in agriculture, and these came principally from Oklahoma, Texas, and Arkansas. The least stability was found among those presently engaged as farm laborers; only 43 percent had remained in one place during 1940, while one-third had lived in three or more places. Stability of residence is related to the length of time the family has been in Arizona. It is significant that occupational adjustment of the migrant group has resulted in a net shift out of agriculture. Prior to migration, 22 percent had been farmers and 13 percent had been farm laborers, making a total of 35 percent formerly in

agriculture. In January 1940 less than 5 percent were farmers and 20 percent were farm laborers. Thus, the total proportion is now one-fourth as compared with over one-third prior to migration.

Social participation of rural families, W. A. ANDERSON, H. H. PLAMBECK, and W. W. REEDER ([*New York*] *Cornell Sta. Rpt.* 1941, pp. 172-173).—Some brief general findings based on 800 records obtained from farm families in Cortland County and from about 400 families in Otsego County are included.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

History of the Land Grant Endowment Fund of the University of Illinois, C. P. SLATER (*Urbana: Univ. Ill., 1940*, pp. 56, figs. 6).—The purpose of this bulletin is to bring together in one publication all the information and records pertaining to the Land Grant Endowment Fund. The material presented is a result of a wide search and careful review of all publications or records which gave any promise of containing information on this subject.

The first portion of this study presents a unified interpretative account of the establishment and growth of the endowment fund, with many side lights on the early administrative history of the university. The second part is made up of excerpts from authoritative source material, and the third part contains statistical and illustrative materials presenting the fundamental facts.

The teaching of biology in secondary schools of the United States: A report of results from a questionnaire, O. RIDDLE ET AL. ([*Lancaster, Pa.*] *Union Amer. Biol. Soc.*, 1942, pp. 76).—The report on this survey includes the following: General Information on the Experience and the Subjects Taught by Biology Teachers, by D. F. Miller (pp. 7-15); Enrollments, Teaching Loads, and College Relations of Secondary School Biology, by H. B. Glass (pp. 16-27); The Training of Biology Teachers, by F. L. Fitzpatrick (pp. 28-36); Buildings, Equipment, and Text-Books Used by Teachers of Biology in Secondary Schools, by E. W. Sinnott (pp. 37-42); Community Backgrounds and School Organizations, by B. C. Gruenberg (pp. 43-53); and Amount and Nature of Biology Teaching in Secondary Schools, by O. Riddle (pp. 54-76).

Security at the grass roots: A report of cooperative extension work in agriculture and home economics, 1940-41, M. L. WILSON and R. BRIGHAM (*U. S. Dept. Agr., Ext. Serr. Rpt., 1940-41*, pp. 11+62).—This annual report summarizes and discusses the educational efforts of the Extension Service during the year. Special emphasis is placed on the efforts related to national defense and security. The material is presented under the following general headings: Security through better nutrition; meeting food-for-defense needs; emphasis on soil conservation; rural family well-being promoted; toward greater economic security; youth replies, "I can!"; and security through understanding. Tables summarize the extension activities and influences during the year and show by States the number of counties with extension agents on July 1, 1915, 1925, 1935, and 1941. Other tables show by States the expenditures from all sources for cooperative agricultural extension work for the year ended June 30, 1940, by sources of funds, and the sources of funds allotted for extension work for the year ended June 30, 1941.

FOODS—HUMAN NUTRITION

Family food consumption and dietary levels: Five regions. Urban and village series, H. K. STIEBELING, D. MONROE, E. F. PHIPARD, S. F. ADELSON, and F. CLARK (*U. S. Dept. Agr., Misc. Pub.* 452 (1941), pp. IV+268, figs. 9).—This volume provides information on expenditures for food and amounts consumed by families in 140 villages and 20 small cities in the five regions surveyed in

the consumer purchases study. An analysis is presented of the nutritional value of diets of families keeping food records in all the nonfarming communities that were surveyed. An earlier report (E. S. R., 85, p. 270) dealt with the food of farm families.

Relative economy of nutrients in servings of some commonly used foods, B. B. KENNEDY ([*New York*] *Cornell Sta. Bul.* 774 (1941), pp. 18, figs. 7).—The relative nutritional economy of 28 different foods was estimated by considering the number of nutrient units (1 unit equals 1 percent of the daily allowance for an adult) per serving portion in relation to the price. The seven nutrients (protein, Ca, Fe, vitamin A, thiamin, riboflavin, and ascorbic acid), each of which was considered separately, were selected as ones likely to be deficient in the diet, while the 28 foods were chosen as common ones for which satisfactory data with regard to nutrients were available. Prices were calculated from averages of retail prices for the 5 yr. from 1936 to 1940 in 51 cities throughout the United States. For each of the seven nutrients the foods were ranked on the basis of the ratio of cost per nutrient unit to number of units in a serving of food. This ratio value was low for cheap foods rich in the nutrient concerned. In summary these rankings are discussed, and it is pointed out that "some foods that apparently cost little may be nutritionally expensive, and foods generally considered expensive may be nutritionally economical."

A nutritive index of fruits, A. F. MORGAN. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 21 (1941), No. 3, pp. 75-77).—Data are tabulated for 20 representative fruits to show the composition as to vitamin A, thiamin, riboflavin, ascorbic acid, calcium, and iron, and the estimated relative nutritive value. "The amounts in 100 gm. of the fruit as purchased of each of the six nutritive requirements for which fruits are valuable were expressed as percent of the daily adult need of those constituents and the average of these six figures used as the 'nutritive index' of the fruits." These index figures were devised to indicate the relative value of equal weights of the fruits as sources of these six dietary needs. It is indicated that consideration should be given these values in choosing fruits for military uses, camps, expeditions, institutions, and ordinary civilian purposes.

Navajo foods and their preparation, M. STEGGERDA and R. B. ECKARDT (*Jour. Amer. Dietet. Assoc.*, 17 (1941), No. 3, pp. 217-225).—The manner of preparation and preservation of foods included in a previous report dealing with their analyses (E. S. R., 83, p. 700) is described in the present paper, the information having been obtained, for the most part, at first hand from the Indians on the Navajo Reservation. Navajo names for the items of foods and for their preparation accompany each description.

The effect of hydrogenation on the nutritive value of the fatty acid fractions of butter fat and of certain vegetable oils, R. K. BOUTWELL, R. P. GEYER, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta. et al.). (*Jour. Dairy Sci.*, 24 (1941), No. 12, pp. 1027-1034, figs. 2).—In continuation of the studies of Schantz et al. (E. S. R., 85, p. 413), saturated and unsaturated fatty acid fractions of butterfat were prepared and converted to the triglycerides which were completely hydrogenated by catalytic hydrogenation. In ad libitum feeding tests with a mineralized skim milk ration supplemented with the hydrogenated saturated or unsaturated fractions of the butterfat, the rats showed growth responses superior to those obtained when butterfat itself or the nonhydrogenated fractions were fed. Corn, coconut, cottonseed, and soybean oils, which were inferior to butterfat in promoting growth, were not improved in nutritive value by complete hydrogenation. The superior growth-promoting property of butterfat is considered probably due to the presence in small amounts of a long chain satu-

rated fatty acid (or acids). The unsaturated fraction of butterfat is relatively rich in an unsaturated form of this compound, which by hydrogenation may readily be converted to the active compound.

Fish liver and body oils: Chemical characteristics, physical properties, and vitamin content, A. D. HOLMES, F. TRIPP, and G. H. SATTERFIELD. (Univ. N. C. et al.). (*Indus. and Engin. Chem.*, 33 (1941), No. 7, pp. 944-949).—The chemical and physical characteristics of 39 fish-liver and body oils were tested by U. S. P. XI methods, and their vitamin A potency was determined by the Hilger spectrophotometric, the Carr-Price colorimetric, or the U. S. P. XI biological assay methods. The vitamin A potency of the swordfish-liver oils increased with increase in the amount of unsaponifiable material, but the relation was not entirely consistent. A similar but less consistent relationship was shown by the mackerel-liver oils. Of the other oils, including liver oils of halibut (7 samples) tuna (7 samples), and 12 miscellaneous fish (single samples each), and body oils of eel, sardine, herring, menhaden, and rosefish (single samples each), there appeared to be no consistent relation between chemical or physical characteristics and their vitamin potency. "Thus, it is extremely difficult if not impossible to gain information concerning the vitamin potency of a fish-liver or body oil by the determination of its chemical and physical characteristics."

Changes in the biochemical composition of the corn kernel during development, J. W. EVANS. (Minn. Expt. Sta.). (*Cereal Chem.*, 18 (1941), No. 4, pp. 468-473, figs. 2).—Samples of a yellow hybrid field corn collected from the fields of the University Farm at St. Paul, Minn., at 15, 22, 29, 36, 43, 50, and 57 days after silking were analyzed for proximate constituents and iodine value and free fatty acids were determined on the ether extract. The data, reported on the basis of the corn kernel as harvested, "show that there was a steady increase in the amounts of crude protein, starch, sucrose, ether extract, and ash in the corn kernels during their development. There was an increase in the percentage of reducing sugars from 15 to 22 days after silking, then a decrease to a more or less constant value after 36 days. There was little change in the percentage of crude fiber in the kernels." On the dry basis "the percentages of starch and ether extract increased steadily to 36 days, at which time they reached a constant value. Crude protein, crude fiber, sugars, and ash decreased as the seed matured. These reached a constant value in about 43 days." As judged from the amount of ether extract and its iodine value and percentage content of free fatty acid, it appeared that oil formation set in at an early stage and that the nature of the oil progressively changed, becoming more and more unsaturated in character.

Amino acids in oats and oat milling products, including rolled oats, F. A. CRONKA. (U. S. D. A.). (*Cereal Chem.*, 18 (1941), No. 4, pp. 523-529, fig. 1).—Cleaned and graded commercial oats, rolled oats, and the two byproducts middlings and shorts, all from the same mill run, and one sample of oats of the Richland variety grown at the Iowa Experiment Station at Ames in 1938 were used in this study. These materials were analyzed, by methods described, for their content of total N, arginine, histidine, lysine, tryptophan, and tyrosine. Cystine was also determined in the samples of whole oats. The two samples of oats differed in total nitrogen content and in amino acid composition. Removal of the hulls and fuzzy hairs covering the oat grain effected an increase in the nitrogen content, the rolled oats (yield, 40 percent on basis of green oats) containing 2.95 percent N, and the middlings and shorts (together, representing about 15 percent of the cleaned oats) containing 3.44 and 2.26 percent of N, respectively, as compared with 2.22 percent in the cleaned oats. By elimination of certain low-nitrogen components in the milling process, the rolled oats not only became richer in nitrogen than the original oat grain, but also gained in nutritional quality of the protein as judged by the increased percentages of

tryptophan, histidine, and lysine. At the same time the percentage of tyrosine was lowered. The protein of the oat byproducts, being low in lysine and essentially lacking in tryptophan, was inferior to that present in the whole oat grain.

Precooked dry rice, a new canned product, J. SUGIHARA and W. V. CRUESS. (Univ. Calif.). (*Canner*, 93 (1941), No. 22, p. 11, fig. 1).—Earlier tests with canned cooked rice showed that the product from unpolished rice became rancid in time. In an extension of the earlier work to improve the procedure, brown rice and white rice were steamed 40 and 30 min., respectively, then dehydrated in an air-blast dehydrator for from 3½ to 4 hr. at 150° F. The dehydrated, cooked brown rice required 20 minutes' cooking with 4½ volumes of boiling water; the white, with 3½ volumes, took 12 min. It is noted that the kernels of cooked, dehydrated brown rices were quite well separated and of good flavor.

Scoring baked potatoes for texture, M. E. FREEMAN. (Mass. Expt. Sta.). (*Food Res.*, 6 (1941), No. 6, pp. 595-598, fig. 1).—The set of visual standards illustrated was prepared by removing the skins from freshly baked tubers, cutting slices from 3 to 5 mm. thick from any (or all) desired parts of the tuber, and drying these on glass plates in a current of air or in an air oven at 50° C. When dried under the latter condition, the mealy tissue became white and very porous and the waxy tissue became a dense, vitreous, horny sheet, light tan in color. The visible contrast between the two types of tissue (even more pronounced when small cubes of potato were dried) was unmistakable, so that the amount and distribution of porous tissue and dense vitreous tissue within the tuber could be readily visualized. The score of a sample slice depended on the proportion of these two types of tissue. The method, aside from providing for ease of differentiation of tissue, permitted the preparation of selected standard samples which could be kept available for direct comparison with any samples to be tested. A set of standards thus prepared and used in the scoring of tubers gave results that compared closely with those obtained with the system described by Sweetman (*E. S. R.*, 76, p. 559).

Locker freezing of fruits and vegetables, E. L. OVERHOLSER, J. A. BERRY, H. C. DIEHL, M. BOGGS, and E. N. TODD HUNTER. (Coop. U. S. D. A.). (*Washington Sta. Pop. Bul.* 161 (1941), pp. 34).—This bulletin, concerned with the technics of food freezing, presents in popular form material covering scientific research and industrial practice compiled from many sources. The recommendations representing the best knowledge now available are concerned with the following topics: Fruits and vegetables suitable for freezing, best varieties of fruits and vegetables for freezing, maturity of produce, handling of produce prior to freezing, preparation of fruits and vegetables for freezing, containers for frozen pack, freezing and storage, care of frozen foods withdrawn from the locker, thawing of frozen fruits and vegetables, nutritive value of frozen fruits and vegetables, microbiology of frozen pack, specific directions for freezing fruits, specific directions for freezing vegetables, and cooking frozen vegetables.

The effect of storage on the protein of wheat, white flour, and whole wheat flour, D. B. JONES and C. E. F. GERSDORFF. (U. S. D. A.). (*Cereal Chem.*, 18 (1941), No. 4, pp. 417-434).—Red winter wheat of the 1937 crop produced in Ohio was experimentally cleaned and milled, with care to prevent heating, to produce a whole-wheat flour and a white-wheat flour of the type known as 95 percent patent (70 percent extraction). Samples of the two flours and of the whole kernels were placed in storage at 30° and 76° F., both in sealed glass jars and in closely woven cotton bags. The effect of storage on the proteins in the samples was studied at various intervals over a period of 2 yr. Three types of changes occurred, namely, (1) a decrease in the solubility of the proteins, (2) a partial break-down of the proteins as indicated by decrease in true protein content and in the amount of nitrogen precipitable by trichloroacetic acid, and

by increase in amino nitrogen, and (3) a decrease in digestibility by pepsin and trypsin. Samples stored at 76° were affected more than those stored at 30°, and those in bags more than those in sealed jars. Changes in white flour were in general greater than in whole-wheat flour, while the changes in the kernels, although significant, were not as great as in the flours. Total nitrogen and free ammonia remained unchanged, as was to be expected, since there were no indications of gross spoilage. The extent of protein denaturation as followed by solubility determinations was greatest for the proteins of white flour soluble in 3 percent NaCl. In these, the decrease in solubility after 2 years' storage at 76° in a bag and in a sealed glass jar amounted to 61 and 57 percent, respectively. The alteration of the proteins is ascribed to the effect of enzymes and oxidation.

Reliability of organoleptic tests, J. W. CRIST and H. L. SEATON. (Mich. Expt. Sta.). (*Food Res.*, 6 (1941), No. 5, pp. 529-536).—A tasting panel of nine "tasters" judged a series of four different fruits with 15 variations of the frozen-pack process in 96 duplicated tests. Vision and scent as well as taste were used in forming judgments. The manner of approach was that of testing the taster's ability to repeat his ranking of samples after the order of placement of the samples had been secretly and completely changed.

From tests involving taste alone, it is concluded that the ordinary tasting panel method, as tested by the criterion of correlation in trials by duplication, is questionable and should be either abandoned or improved. Tests designed for closer control of the tasting method allowed for the exercise of vision, scent, and taste separately and jointly on the same series of samples. In addition, the practice of attempting to score specific properties of the sample was abandoned and the sample was judged as a unit. A second innovation was that of designating a standard as unity (sample of supposedly lowest quality) and scoring the others upward from it as a fixed base. Rank correlation coefficients obtained in these tests were analyzed for their significance. The results indicated that scent is less sensitive and even less accurately discriminative than taste, and that of the three senses vision is the most reliable for the ranking of samples and the duplication of ranks. Vision, when admitted in the operation, tended to offset the inconsistent behavior of the other senses.

Auto-oxidation of filtered citrus juices, J. J. HAMBURGER and M. A. JOSLYN. (Univ. Calif.). (*Food Res.*, 6 (1941), No. 6, pp. 599-619, figs. 5).—Orange and lemon juice, prepared by burring, straining, and filtering with filter-cel, and preserved by adding 0.3 percent sodium benzoate, was divided into three lots of each juice. The juices were made up to 0, 250, and 500 p. m. sulfur dioxide, and air was then bubbled through them for several hours, following which they were stored at room temperature, and samples were removed periodically for examination as follows: Total iodine value, 2,6-dichlorophenolindophenol titration, double-iodine titration, mercuric acetate precipitation method, and sulfur dioxide determination. The results, presented and discussed at length, led to the following conclusions:

"Lemon juice was oxidized by atmospheric oxygen much more readily than orange juice. Dehydroascorbic acid or similar iodine-reducing substances decreased at first at a rate proportional to that at which free vitamin C was reduced, but then reached a constant minimum value which was independent of presence or concentration of sulfur dioxide. At the beginning of oxidation there was preferential oxidation of sulfur dioxide. Darkening did not occur until all the vitamin C was in the dehydro or some other form and there were no more readily oxidizable substances, such as sulfur dioxide, present in the juice."

Effect of storage conditions on palatability of beef, R. M. GRISWOLD and M. A. WHARTON. (Mich. Expt. Sta.). (*Food Res.*, 6 (1941), No. 5, pp. 517-528).—"To test the effect on meat quality of several types of storage, right and left

sides of three series of 10 beef animals each were subjected to different treatments . . . Meat stored 37 days had a somewhat stronger aroma and flavor but was slightly less juicy than meat stored 9 days. Differences in the tenderness and desirability of flavor of meat stored for the two periods were small. Meat held at 60° for 48 hr. was less desirable in appearance and odor than meat held under similar conditions but with ultraviolet lights. The palatability and tenderness of meat ripened by these two methods were similar, however, showing that the lights themselves did not affect the quality of the stored meat. Meat stored at 36° and meat held for the same length of time at 60° with irradiation graded approximately the same in palatability, except for tenderness, which was slightly greater in meat stored at the higher temperature."

Factors affecting temperature changes in dressed poultry during refrigeration, I. L. WILLIAMS and E. M. FUNK (*Missouri Sta. Res. Bul.* 334 (1941), pp. 39, figs. 17).—The time required for cooling, freezing, and thawing of different sections of poultry carcasses showed the same order in temperature changes as ascertained by electrical resistance thermometers installed in various regions of the dressed birds. Factors affecting the rate of cooling, freezing, and thawing were size and shape of bird, weight, moisture content, fat content of the meat, and amount of exposed surface per unit of weight. Males appeared to cool, freeze, and thaw more rapidly than females. Circulating air reduced the time required for these operations by approximately one-half. The rate of freezing varied directly with the temperature. Thawing required somewhat less time than freezing.

The properties and functions of the plasma proteins, with a consideration of the methods for their separation and purification, E. J. COHN (*Chem. Rev.*, 28 (1941), No. 2, pp. 395-417, figs. 4).—This review considers the fibrinogen, the α -, β -, and γ -globulins, and the albumin components of the plasma. The diverse nature of these proteins is discussed, and the physicochemical bases for their characterization are defined. Consideration is given to the relationship between physiological and chemical functions of certain proteins; to procedures permitting large-scale preparation of the different proteins of human and animal plasma, thereby furthering chemical and clinical investigations of their functions and possible therapeutic uses; and to comparative studies on the physical, chemical, and immunological properties of bovine, of chemically modified bovine, and of human albumins and globulins. It is pointed out that the "high osmotic pressure, low viscosity, and great stability of albumin solutions would appear to render them the most useful of the plasma proteins for the treatment of some, but not necessarily all, conditions associated with diminished plasma volume."

The effect of autoclaving on the nutritive value of the proteins in cottonseed meal, H. S. OLCOTT and T. D. FONTAINE (*Jour. Nutr.*, 22 (1941), No. 4, pp. 431-437, figs. 2).—Gossypol-free (ether-extracted) cottonseed meal was autoclaved with steam (17 lb. pressure) for periods of ½, 1, and 2 hr. The nutritive value of the proteins in the various preparations was evaluated by the ability to stimulate growth in ad libitum feeding, at 12- and 24-percent protein levels. The results showed that the nutritive value of the meal decreased during autoclaving until after 2 hr. of such treatment it was capable only of maintaining weight when fed at the 12-percent protein level. Animals fed the 2-hr. autoclaved meal were only slightly benefited by supplementation with lysine. Supplementation with histidine was ineffective.

Rôle of the intestinal bacteria in the decomposition of pectin, S. C. WERCH, A. A. DAY, R. W. JUNG, and A. C. IVY (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 4, pp. 569-572).—Pure citrus pectin dissolved in a buffer solution of desired pH, and diluted with sugar-free broth, was sterilized by filtration

through a specially prepared Berkefeld filter. Human and dog feces (resulting from a normal diet and one with pectin added) were incubated in the pectin medium. Decomposition of the pectin was followed by observing gas formation and changes in titratable acidity and pH, in viscosity, and in pectate formation, absence of the latter pointing to a break-down beyond the gel stage. The results presented "show that pectin is decomposed by bacteria present in feces obtained from human and canine subjects on a normal diet and one after pectin had been added."

On the fate of ingested pectin, S. C. WERCH and A. C. IVY (*Amer. Jour. Digest. Diseases*, 8 (1941), No. 4, pp. 101-105).—In four dogs on a basal diet without pectin no pectic acid was found in the feces, but from 0.37 to 0.42 gm. of furfural and from 0.72 to 0.90 gm. of uronic acid were obtained during the 7-day test period. When 20 gm. of pectin was added to the diet for 7 days, the total recoveries of pectin from the feces averaged 8.62 percent by furfural estimation, 8.86 percent by uronic acid estimation, and 3.35 percent by pectic acid estimation, representing an average decomposition of the pectin amounting to about 93 percent. Similar data on the same dogs receiving the pectin when fasting showed an average decomposition of pectin amounting to only 50 percent, the recoveries depending upon the greater passage through the intestinal tract. In six human subjects fed 50 gm. of pectin per day for 3 days as a supplement to a mixed diet, the percentage recoveries by the three methods amounted to 7.44, 8.70, and 1.15 percent, respectively, giving an average decomposition of about 94 percent. During fasting, however, the recoveries were considerably less than in the fasting dogs, amounting to 12.21, 13.75, and 4.16 percent, respectively, and representing an average decomposition of about 90 percent. Ileostomy material from two dogs and two human subjects following the ingestion of 20 gm. of pectin with 1 lb. of beef (dogs) and with a low crude fiber diet (humans) gave a pectin recovery of from 84 to 89 percent in the dog and from 94 to 97 percent in the human in the 24-hr. study and 72 to 80 percent in the 12-hr. study.

These results are thought to indicate that in both the human and the dog the pectin break-down occurs chiefly in the colon rather than in the upper intestines, and that bacterial enzymes rather than the enzymes of the animal organism are involved.

The effect of the level of calcium intake on the biological value of a protein, K. M. HENRY, S. K. KON, and S. Y. THOMPSON (*Biochem. Jour.*, 34 (1940), No. 7, pp. 998-1001).—The biological value of egg white protein fed over two experimental periods at about an 8½-percent level to two groups of rats—one on a low-calcium (0.07 percent) and the other on a high-calcium (0.86 percent) diet—was determined by the Mitchell paired-feeding method. For these two groups, respectively, mean biological values of 90.4 and 89.7 and mean true digestibilities of 99.6 and 97.7 were obtained for the egg white. The differences between the two groups were not statistically significant, and it is concluded, therefore, that the availability of dietary nitrogen is not decreased when the diet is deficient in calcium.

The calcium content of southern California head lettuce and its distribution in the outer and inner leaves, M. G. MALLON and F. P. UREY. (Univ. Calif.). (*Jour. Home Econ.*, 33 (1941), No. 3, pp. 182-186).—Five lots of California head lettuce grown for the market were obtained from known sources. Three locations, four soil types, five different fertilizer treatments, irrigation with three water systems, and two varieties were represented. The plants, taken as harvested or directed from the truck garden, included all the leaves. The outer leaves were removed from the plant until it had the appearance of head lettuce as seen in the market, and the two parts were analyzed separately for their content of moisture and calcium.

Three samples of the variety California Iceberg No. 152 contained, respectively, 0.089, 0.105, and 0.111 percent of calcium (wet basis) in the outer leaves, which represented 48.9, 46.1, and 38.1 percent of the weight of the plant, while the corresponding percentages of calcium for the heads were 0.019, 0.033, and 0.027. Two samples of New York Imperial No. 615 contained 0.093 and 0.096 percent of calcium in the outer leaves (which constituted 29.9 and 32.7 percent of the weight of the plants) and 0.030 and 0.031 percent in the head. These figures indicate that the outer leaves, usually discarded for the retail market, represented about one-third or more of the entire plant by weight and had a calcium content about three times that of the heads.

The utilization of the calcium of cauliflower and broccoli, M. L. FINCKE. (Oreg. State Col.). (*Jour. Nutr.*, 22 (1941), No. 5, pp. 477-482).—"Young rats in strict litter-mate comparison were fed diets in which practically all of the calcium was derived from dried milk, or in which half of the milk was replaced by dried broccoli or cauliflower to provide approximately the same amounts of calcium. At 60 days of age they were killed and their bodies analyzed for calcium. The calcium utilization factor for the milk diet amounted to 0.87 ± 0.017 , of the diet containing broccoli to 0.79 ± 0.018 , and of the diet containing cauliflower to 0.69 ± 0.020 ." These factors were obtained by dividing the amount of calcium stored during the 32 days on the diet by the amount of calcium ingested. The dried broccoli contained 0.38 percent oxalic acid and 0.7 percent crude fiber; corresponding figures for the dried cauliflower were 0.24 and 0.6 percent. It is reasoned that if the oxalate rendered an equivalent quantity of calcium unavailable, the available rather than the total calcium should be the basis for calculation. On this basis the calcium utilization factors averaged 0.80 for broccoli and cauliflower diets. Previous work having shown that the presence of added fiber lowered the availability of the calcium by about 8 percent, it is estimated that the calcium utilization factor of the milk diet would be lowered to 0.80 by the presence of as much fiber as was contained in the broccoli and cauliflower diets. "The combination of the fiber and the oxalate contents of the broccoli and cauliflower diets could, therefore, account for the total lowering of the availability of the calcium of these two diets, and may actually have been the causes of poorer utilization of the calcium of broccoli and cauliflower."

Life-time experiments upon the problem of optimal calcium intake, F. O. VAN DUYN, C. S. LANFORD, E. W. TOEPFFER, and H. C. SHERMAN (*Jour. Nutr.*, 21 (1941), No. 3, pp. 221-224).—"A diet of five-sixths ground whole wheat, one-sixth dried whole milk with sodium chloride, and water, although adequate for rats generation after generation, was nevertheless suboptimal in calcium, riboflavin, and vitamin A, and in these respects representative of a rather large proportion of human diets. This diet, used as a starting point in the experimental study of different dietary enrichments, was supplemented with calcium salts to give calcium levels equivalent to 0.64 or 0.8 percent of the dry food mixture, these representing about three or four times the minimal adequate level. These higher levels of calcium gave the best results in permanent nutritional well-being, as judged by the effect upon body weight at different ages, duration of reproductive life, success of the females in bearing and rearing young, and in length of life of each sex, as observed in full-life experiments in three generations of rats maintained under laboratory conditions.

The assimilation of fluorine by rats from natural and synthetic cryolite and from cryolite-sprayed fruits, M. LAWRENZ and H. H. MITCHELL (Ill. Expt. Sta.). (*Jour. Nutr.*, 22 (1941), No. 5, pp. 451-462).—"Four experiments involving the controlled feeding and chemical analysis of 24 trios and 24 pairs of growing animals were conducted according to the general plan of previous

studies (E. S. R., 82, p. 421). The present experiments were "designed to detect and measure differences in retention by animals of the fluorine in natural Greenland and domestic synthetic cryolite and possible modification of such retentions by the particle size of mineral, by the weathering of spray chemicals on the fruit, and by the development of the wax coating on the surface of sprayed apples." The growth data and the fluorine metabolism data secured in the four experimental comparisons are presented, together with the results of statistical analysis as to the significance of pair differences. From the results it is concluded that (1) the fluorine of synthetic cryolite is appreciably more completely retained by animals than the fluorine of natural cryolite, probably because of the greater solubility of the fluorine; (2) the degree of fineness of the cryolite may modify the assimilation of the contained fluorine; (3) the weathering of natural Greenland cryolite on sprayed fruit does not appreciably affect its assimilability by animals, nor presumably its toxicity, while (4) weathering of synthetic cryolite slightly lowers the assimilability of its fluorine, probably by leaching out some or all of the more soluble compounds of fluorine; and (5) the development of a wax coat on apples sprayed with cryolite may possibly impair the assimilability of the contained fluorine as suggested by the greater difficulty in removing the spray residue by commercial washing. The experimental results obtained did not offer particular support to this conclusion, however.

Distribution of minerals and vitamins in different parts of leafy vegetables, O. SHEPERS, O. A. LEONARD, and M. GIEGER. (Miss. Expt. Sta.) (*Food Res.*, 6 (1941), No. 6, pp. 553-569).—Data obtained in studies over a period of years are summarized and discussed. Information is given concerning the nature and source of the samples, most of which were of known origin. Calcium and phosphorus were determined by the A. O. A. C. methods; iron at first colorimetrically and later by the *o*-phenanthroline method with the use of the Cenco-Sheard Photometer; vitamin C by the method of Mack and Tressler (E. S. R., 78, p. 154); and carotene by Photometer readings on the washed petroleum ether extract of a purified potassium hydroxide extract of the plant material. On the dry basis, green leaves of cabbage contained from $1\frac{1}{2}$ to 3 times as much iron, 3 times as much calcium, and somewhat less phosphorus than the bleached leaves. Green leaves of lettuce also contained from $1\frac{1}{2}$ to 3 times as much iron as the inner leaves, and green asparagus contained more iron than the bleached, although the difference in this case was less pronounced than with the leafy vegetables. Leaves of collards, mustard, lambsquarters, and pokeberry contained from 2 to 3 times as much iron as the petioles (or petioles and stalks combined in lambsquarters and pokeberry), and the leaf blades of mustard and turnip greens contained from 3 to 4 times as much iron as their petioles and midribs. In Seven-Top turnips, grown from the same seed in five different areas and on different soil types, the calcium content of the leaf blades and of the petioles and midribs was approximately the same (dry basis), while the phosphorus content of the leaf blades was from one-fourth to three-fourths greater than that of petioles and midribs. In the vegetables analyzed carotene was from 5 to 20 times and vitamin C from 5 to $6\frac{1}{2}$ times more concentrated in the leaf blades than in the petioles (dry basis). In Swiss chard, tendergreens, collards, and dock the midribs had a higher percentage of carotene and vitamin C than did the petioles. Green leaves of cabbage had 21 times more carotene and one-half more vitamin C than the bleached inner leaves (dry basis).

Chemical analyses and vitamin assays of macadamia nuts, C. D. MILLER and L. LOUIS. (Hawaii Expt. Sta.). (*Food Res.*, 6 (1941), No. 6, pp. 547-552, fig. 1).—Two samples of vacuum-packed factory run of macadamia nuts were obtained in the raw and cooked states, but without salt, from a commercial

factory in Honolulu. The cooked nuts were found to have the following average percentage composition: Moisture 1.3, protein 9.3, fat 78.2, crude fiber 1.8, carbohydrate 8.0, total ash 1.39, calcium 0.053, phosphorus 0.240, and iron 0.0020. Proximate constituents were determined by A. O. A. C. methods, calcium by the McCrudden volumetric method, and iron in the ash by the *o*-phenanthroline method for color production. Biological tests indicated the absence of vitamin A. Thiamin, determined by the method of Miller (E. S. R., 81, p. 875), averaged 486 μ g. per 100 gm. in the uncooked nuts and 408 μ g. after cooking by the commercial process. This cooking (in refined coconut oil at 135° C. for from 12 to 15 min.) resulted in a loss of 16 percent of the original thiamin content.

[Vitamin studies by the Missouri Station] (*Missouri Sta. Bul.* 438 (1941), pp. 7-11, 69, figs. 2).—Progress reports are given for work on vitamin B, intermediates and on cataract in rats on flavin-deficient diets, both by A. G. Hogan and L. R. Richardson; pigeon anemia due to a vitamin deficiency, by Hogan and J. G. Lee; and vitamin content of plants as influenced by cultural treatment, by C. G. Vinson.

The provitamin A content of American whole wheat flour and whole wheat bread, L. ZECHMEISTER and R. B. ESCUE (*Natl. Acad. Sci. Proc.*, 27 (1941), No. 11, pp. 528-532).—Five freshly milled, unbleached whole-wheat flours from American wheats were found to contain β -carotene to the extent of about 0.02 to 0.06 mg. per kilogram, as estimated by means of the Tswett chromatographic adsorption method. Whole-wheat bread was even poorer in carotene. These results, confirming earlier ones by Zechmeister and Chohnoky⁴ with Hungarian wheats, which contained no more than 0.01 mg. of carotene per kilogram and were free from cryptoxanthin, indicate that wheat flour and bread are of no importance as sources of provitamin A.

Effect of vitamin A on the secretion of gastric juice in deficient hydrochloric acid production, F. FÖLDES and G. VAJDA (*Brit. Med. Jour.*, No. 4182 (1941), pp. 317-318).—Among 20 cases of achlorhydria or hypochlorhydria treated by daily administration for 2 or 3 weeks of vitamin A in doses of 40,000 International Units contained in 20 drops of a concentrate given 30 min. before a test meal, 12 responded with improvement in symptoms, increase in weight, and increases in total and free HCl. The patients who responded favorably were those with chronic inflammation of the gastric mucosa or in whom the deficient acid secretion was secondary to functional alterations of some other organ. The dosage recommended consists of 16,000 I. U. of vitamin A three times a day for 2 weeks, followed by 8,000 I. U. three times a day for a further 2 weeks, repeating the course after an interval of 4 weeks.

Factors affecting the Pett visual test for vitamin A deficiency, L. B. PETT and M. K. LIPKIND (*Canad. Jour. Res.*, 19 (1941), No. 4, Sect. B, pp. 99-108, fig. 1).—In this paper, designated the fourth in the series (E. S. R., 84, p. 702), an extensive study of factors influencing the visual test for vitamin A with the apparatus described in an earlier paper and now called the vitrometer is reported and summarized as follows:

"Under the conditions prescribed, . . . It has been found that (1) antecedent light does not affect the median of the three tests usually performed; (2) no error results from the wearing or not wearing of glasses; (3) the use of pilocarpine to contract the pupils is not advisable; (4) some light may be admitted into the test room; (5) the time of exposure to the bright light (30 sec.) is suitable; (6) repeated tests cause a 'learning' effect so rarely as to be of little concern; (7) the standard error of the mean is ± 1.4 and of the median is ± 2.4

⁴ Jour. Biol. Chem., 135 (1940), No. 1, pp. 31-36.

sec. Some results are presented suggesting that a diurnal rhythm in the vitamin A content of the blood exists."

On vitamins in wheat germ. H. H. BUNZELL (*Science*, 93 (1941), No. 2410, pp. 238-239).—From yeast fermentation tests in the presence of wheat germ extract or a combination of the various known B vitamins, it is concluded that "wheat germ contains a water-soluble heat-stable component which stimulates yeast cells to greater activity in a manner usually attributed to vitamins. The effect is much greater than that of other vitamins studied. It may be due to a single or a mixture of essential food factors as yet not recognized." This is thought to be of particular significance in connection with the problem of enriching flour and bread.

The B vitamins and fat metabolism.—IV, **The synthesis of fat from protein.** E. W. McHENRY and G. GAVIN (*Jour. Biol. Chem.*, 138 (1941), No. 2, pp. 471-475, fig. 1).—In this continuation of the series (E. S. R., 84, p. 709), the effect of the various B vitamins upon the body weights of rats fed a high-protein diet was determined, following the same general plan as in the earlier studies of the series.

The administration of thiamin alone or in various combinations with riboflavin, pyridoxin, pantothenic acid, nicotinic acid, and choline resulted in losses in weight for all combinations except those containing pyridoxin. Pyridoxin administered with thiamin prevented the weight losses occurring with thiamin alone. The further addition of pantothenic acid and riboflavin resulted in gains in weight which were not increased by further additions of nicotinic acid or choline. Pyridoxin also showed the lipotropic effect reported by Halliday (E. S. R., 80, p. 854), as lower values of liver fat were obtained in all cases when pyridoxin was given. The lowest value for body fat was found in the animals receiving pyridoxin as the only supplement, but all combinations containing pyridoxin gave higher values than all combinations in which it was not present. The highest values were obtained when all of the supplements were included.

"No information is available to indicate the nature of the mechanism by which pyridoxin brings about fat synthesis from protein. As a hypothesis it is suggested that pyridoxin is necessary for such stages of protein metabolism as may be essential for the formation of carbohydrate. The previously demonstrated action of thiamin in promoting fat synthesis from carbohydrate would explain why pyridoxin alone has been found to have no effect in these experiments."

Thiamine, nicotinic acid, riboflavin, and pantothenic acid in rye and its milled products. A. J. INDE and H. A. SCHUETTE. (Univ. Wis.). (*Jour. Nutr.*, 22 (1941), No. 5, pp. 527-533).—Representative products of the rye-milling process, namely, whole-rye meal, rye germ, middlings, dark flour, and white flour, were assayed for (1) thiamin, at first by the method of Emmett, Pencock, and Brown (E. S. R., 85, p. 727) and later by an unpublished method of B. W. Henry; (2) nicotinic acid by the method of Snell and Wright (see page 12); (3) riboflavin by the method of Snell and Strong (E. S. R., 82, p. 587); and (4) pantothenic acid by the method of Pennington, Snell, and Williams (E. S. R., 85, p. 442). The middlings and flours were obtained in duplicate series, one ground from whole rye and the other, according to common milling practice, from rye which had been degerminated. The data are reported to show the micrograms of each vitamin per gram of the product, and also to show the percentage distribution of the vitamin in the whole grain among the several products. Except for pantothenic acid, the concentration of each of the vitamins was greatest in the germ. The middlings were also rich in each of the vitamins, but especially in pantothenic acid. Straight rye flour, constituting about 80 percent of the grain,

contained about two-thirds of the vitamins of the grain; about half of these vitamins were in the dark portion which constituted only one-third of the total flour. Degeneration of the rye prior to milling failed to remove enough of the vitamins to be detectable by the methods used, because the germ constituted such a small part of the kernel. Bleaching appeared to cause no vitamin losses except possibly in the case of riboflavin.

Vitamin B₆, pantothenic acid, and unsaturated fatty acids, as they affect dermatitis in rats, L. R. RICHARDSON, A. G. HOGAN, and K. F. ILSCHNER (*Missouri Sta. Res. Bul. 333 (1941), pp. 12, figs. 4*).—Results obtained in the experiments described are summarized by the authors as follows:

"Pyridoxin and pantothenic acid together permanently healed rat dermatitis. If vitamins A and D were provided by including cod-liver oil in the diet, which also supplied essential fatty acids, female rats attained weights of 175 to 180 gm. If the fatty acid content of the diet was reduced to a minimum by supplying vitamins A and D in a fat-free form, the rats developed a marked scaly condition on the tails and feet and succumbed except when linoleic or arachidonic acid was supplied. If either fatty acid was supplied in addition to the two vitamins, pyridoxin and pantothenic acid, the rats were normal and females attained weights of 175 to 195 gm. Linoleic acid was more effective than methyl arachidonate in protecting against dermatitis but neither gave permanent protection. A combination of fatty acid with only one of the two vitamins, pyridoxin or pantothenic acid, was equally ineffective. The lesions characteristic of the dermatitis due to either pyridoxin or pantothenic acid deficiency were indistinguishable on gross examination."

Nonpellagrous eruptions due to deficiency of vitamin B complex, P. GRÖSS (*Arch. Dermatol. and Syphilol., 43 (1941), No. 3, pp. 504-531, figs. 5*).—A series is reported of 13 cases of extensive and localized skin eruptions not quite conforming with any conditions of known entity, but all responding to parenteral liver therapy. It is suggested that the condition is the result of deficiency of the vitamin B complex, but is more commonly due to a constitutional predisposition based upon an abnormal functioning of the skin interfering with the proper utilization of the vitamins than to a low intake. As a result of the liver treatment, "not only is the dermatosis influenced but probably also the underlying disorder of digestion and assimilation so that recurrences may in some cases be prevented for an indefinite period." Attempts to duplicate the effects of the liver therapy with such vitamins of the B complex as have been isolated have thus far proved unsuccessful.

The report contains a tabulated comparison of the clinical manifestations in man, dog, pig, rat, and chicken resulting from deficiency of important fractions of the heat-stable vitamin B complex.

Vitamin B in ophthalmology, C. A. VEASEY, JR. (*Arch. Ophthalmol., 25 (1941), No. 3, pp. 450-468*).—This review of the literature, with numerous references as footnotes, is given under the headings ocular physiology and distribution of thiamin and riboflavin and experimental and clinical evidence of ophthalmic vitamin B deficiency. Ten case reports from the author's experience with vitamin therapy, chiefly thiamin, for various ocular disturbances are presented and discussed.

Some observations on vitamin B₆ deficiency in the dog, H. R. STREET, G. R. COWGILL, and H. M. ZIMMERMAN (*Jour. Nutr., 21 (1941), No. 3, pp. 275-290, figs. 3*).—The characteristic symptoms and signs of vitamin B₆ deficiency in the dog are reported to include a severe anemia, developing in from 120 to 320 days and responding to treatment with vitamin B₆ with a rapid rise in erythrocyte and hemoglobin levels. In some cases marked symptoms of cardiac difficulties were noted after 300 days or more. Animals coming to autopsy showed

degenerative changes in the myelin sheaths of the peripheral nerves and of the spinal cord. Changes of a lighter degree and occurring only in the peripheral nerves were observed in the controls receiving vitamin B₁ concentrate. Gastric juice analyses carried out in the latter part of the experiment suggested a decrease in the secretion of acid and possibly in the volume of juice. Controls receiving vitamin B₁ did not become anemic and showed no evidence of cardiac dysfunction.

Thiamin content of typical soft wheat mill streams, M. R. SHETLAR and J. F. LYMAN. (Ohio State Univ.). (*Cereal Chem.*, 18 (1941), No. 5, pp. 666-671).—The method of Wang and Harris (E. S. R., 83, p. 851) for determining thiamin in urine was adapted for application to cereals from which the extract was prepared by preliminary hydrolysis of the sample by heating with 2 percent acetic acid on the water bath, followed by partial neutralization and digestion with takadiastase. The clear supernatant fluid obtained upon centrifuging was purified by extraction with isobutyl alcohol, and the aqueous extract remaining was used in appropriate aliquots for color development by oxidation of the thiamin with alkaline ferricyanide. The color derivative was extracted with isobutyl alcohol for comparison in a Pfaltz and Bauer fluorometer, with a quinine sulfate solution used as a standard.

Results by this method were found to check closely with those obtained by the method of Hennessy and Cerecedo (E. S. R., 82, p. 588) using zeolite. Certain trials made without the use of takadiastase for hydrolyzing possible phosphate complexes of thiamin suggested that the use of takadiastase may be unnecessary in the analytical procedure, at least in the case of flour. The method developed was applied to representative samples of flours, together with typical samples of red dog, shorts, and bran, all from the same sample of commercial Ohio soft wheat and obtained from a mill employing a five-break, seven-reduction system. The thiamin content of the flours varied between 0.7 and 3.9 $\mu\text{g.}$ per gram, following roughly their respective ash contents. Red dog flour contained 10.1 $\mu\text{g.}$ per gram, while shorts, which probably contained much of the germ as well as fine bran, contained 10.2 $\mu\text{g.}$ per gram and the bran 5.7 $\mu\text{g.}$ These results suggest that large losses in thiamin are caused by the removal of the shorts and red dog fractions from bread flour. Low-grade flours were found to have slightly lower thiamin values than the whole wheat from which they originated.

The thiamin and riboflavin contents of wheat and corn, R. T. CONNER and G. J. STRAUB (*Cereal Chem.*, 18 (1941), No. 5, pp. 671-677).—The method previously described by the authors, and noted on page 9, for the combined determination of thiamin and riboflavin was used in the present study. The 15 varieties of hard-kernel types of wheat, averaging 5.03 $\mu\text{g.}$ of thiamin per gram (range 3.65-6.90 $\mu\text{g.}$), were somewhat richer in this vitamin than were the soft types (16 varieties), which averaged 3.52 $\mu\text{g.}$ per gram (range 2.43-4.77 $\mu\text{g.}$); the two types were similar in riboflavin content, the hard wheats averaging 1.17 $\mu\text{g.}$ per gram (range 0.89-1.91 $\mu\text{g.}$) and the soft wheats 1.07 $\mu\text{g.}$ per gram (range 0.81-1.48 $\mu\text{g.}$). Wheats sampled according to representative wheat-producing areas, rather than by varieties, varied in thiamin content with the different regions, although environmental conditions appeared not to influence the riboflavin content. Variations in riboflavin were also not associated with protein content. Thiamin, however, tended to increase with increasing amounts of protein. Twelve samples of white and 16 of yellow corn averaged, respectively, 4.40 and 3.80 $\mu\text{g.}$ of thiamin per gram (respective ranges 2.54-7.40 and 2.33-5.98 $\mu\text{g.}$), while corresponding riboflavin values were 1.32 and 1.30 $\mu\text{g.}$ per gram (ranges 0.92-2.29 and 0.84-2.02 $\mu\text{g.}$). Wheat germ contained from 30 to 45 $\mu\text{g.}$ of thiamin and from 4 to 5 $\mu\text{g.}$ of riboflavin per gram, while corresponding values for corn germ were from 19 to 33 and from 2 to 5 $\mu\text{g.}$

Fate of thiamine in the digestive secretions, D. MELNICK, W. D. ROBINSON, and H. FIELD, JR. (*Jour. Biol. Chem.*, 138 (1941), No. 1, pp. 49-61).—Thiamin was found to be stable in normal gastric juice from pH 1.5 to 8.0 during incubation for 16 hr. at 37.5° C. and also in hemin-containing gastric juice and in gastric juice from patients with achlorhydria. In the presence of magnesium trisilicate there was almost complete loss of the vitamin attributed entirely to adsorption, with calcium and magnesium carbonate there were appreciable losses attributed to both adsorption and alkaline destruction, and with aluminum hydroxide there were slight losses due to adsorption. On incubation for 16 hr. with bile at its natural pH there was an apparent loss of from 50 to 90 percent, but subsequent incubation with a yeast preparation resulted in the recovery of some of the thiamin so that the true loss amounted to only from 40 to 55 percent of the added thiamin. The source of the extra thiamin was shown not to be the phosphorylated vitamin and has not been identified. With adjustment of the pH of the bile to the acid side, the thiamin became more stable and at pH 4.5 there was no destruction. In a few tests with pancreatic juice at its natural pH of 8.1 the results were similar to those with bile.

In discussing these results the authors point out that losses of thiamin *in vivo* are probably appreciably less than in similar reactions *in vitro*, owing to the protective action of the other constituents of the diet and the retention of the vitamin in the stomach when given with food. "However, even though the losses of the vitamin are not nearly as great *in vivo*, such losses are of physiological importance because of the fact that the average American diet is close to the border line of adequacy with respect to thiamin intake."

Urinary excretion of thiamine on high fat and high carbohydrate diets, W. H. CAHILL (*Jour. Nutr.*, 21 (1941), No. 4, pp. 411-418, fig. 1).—Large alterations in the ratio of fat to carbohydrate in diets of the same thiamin content were found not to affect the urinary thiamin excretion significantly whether the intake of thiamin had been high or low. Likewise, comparable high-fat and high-carbohydrate diets appeared to have no influence on the excretion of thiamin administered orally after a period of depletion.

The urinary excretion of bisulfite binding substances by human adults on thiamin-low diets, M. E. SHULS, H. G. DAY, and E. V. McCOLLUM (*Amer. Jour. Med. Sci.*, 201 (1941), No. 4, pp. 561-569).—The technic developed by the authors for the determination of bisulfite-binding substances in human urine is described, and the results are reported of its application in thiamin depletion tests conducted on two male and two female subjects. Evidence of low intake of thiamin from the test diet was furnished in 24-hr. thiamin excretion tests and thiamin tolerance tests by the method of Najjar and Holt (*E. S. R.*, 86, p. 132). In spite of the dietary deficiency in thiamin, no rise in B. B. S. excretion was found during the experimental period which, in the case of the male subjects, covered 29 and 37 days, respectively. Physical examination of these subjects at the termination of the thiamin depletion showed both to be clinically normal. No symptoms definitely ascribable to the deficiency could be found. Loss of appetite and occasional periods of fatigue were noted, but these persisted after thiamin administration.

On the basis of these findings, which are discussed with reference to the contrary findings reported by Banerji and Harris (*E. S. R.*, 83, p. 851) for urine and with divergent results reported in the literature for B. B. S. in the blood and for the time of appearance of subjective symptoms of thiamin deficiency, it is concluded that "In adult humans, at least, the level of thiamin excretion, especially after a test dose, is a more sensitive and reliable indicator of the level of thiamin nutrition than are measurements of B. B. S. and pyruvic acid. However, the concentration of thiamin in blood and urine gives no information on

the condition of intermediate carbohydrate metabolism in the body. More research is necessary on the relationships between B. B. S., pyruvic acid, and thiamin levels in blood and urine."

Nicotinic acid content of meat and meat products, J. M. MCINTIRE, H. A. WAISMAN, L. M. HENDERSON, and C. A. ELVEHJEM. (Wis. Expt. Sta. et al.). (*Jour. Nutr.*, 22 (1941), No. 5, pp. 535-540).—Various organ and muscle tissues of beef, pork, lamb, and veal, and muscle tissue of fish and chicken were analyzed for their nicotinic acid content by a cyanogen bromide method essentially like that of Melnick and Field (E. S. R., 85, p. 584), but with the slight modifications described by Walsman and Elvehjem (see page 11). The dried tissue analyzed represented samples previously assayed for nicotinic acid by Walsman et al. (E. S. R., 84, p. 563), as well as additional samples which were assayed previously by Mickelsen et al. for thiamin (E. S. R., 81, p. 741) and for riboflavin (E. S. R., 82, p. 853), by Walsman et al. (E. S. R., 82, p. 231) for pantothenic acid, and by Henderson et al. (E. S. R., 86, p. 427) for pyridoxin. All of the tissues analyzed were found to contain a significant amount of nicotinic acid. Liver was richest, containing from 50.8 to 94.5 mg. per 100 gm. on the dry basis, or from 13.2 to 29.8 mg., with an average of 18 mg., per 100 gm. on the fresh basis. Kidney was next, with from 14.7 to 47.9 mg. per 100 gm. on the dry basis, or from 5.2 to 10.5 mg., with an average of 8.2 mg., per 100 gm. on the fresh basis. Cooking and commercial processing caused some loss of the vitamin.

Excretion of nicotinic acid in pellagra, A. P. BRIGGS. (Univ. Ga.). (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 3, pp. 374-378).—Observations by Kühnau (E. S. R., 83, p. 714), Swaminathan (E. S. R., 84, p. 707), and Harris and Raymond (E. S. R., 84, p. 274) that the excretion of nicotinic acid by pellagrins is not very different from that by healthy individuals are confirmed in a series of tolerance tests on patients with classic pellagra or signs of multiple deficiency, and on a group of controls, including normal individuals, patients with no signs of deficiency disease, and others with a past record of pellagra. Three types of tolerance tests were used—(1) the excretion of nicotinic acid in the urine during the 6-hr. period following its administration in 25-mg. doses at midnight, the test being repeated on two successive nights with comparisons of the excretion over similar periods before and after the test dose, (2) the urinary excretion during 6 hr. immediately following the oral administration of a large dose, 200 mg., of nicotinic acid, and (3) the urinary excretion for 3 hr. following the intravenous administration of 25 mg. of nicotinic acid. Nicotinic acid was determined by the cyanogen bromide-aniline method with the hydrolysis technic of Melnick et al. (E. S. R., 86, p. 11) and the technic for color development of Pearson (E. S. R., 82, p. 86).

In (1) the range of values in the preliminary period was 0.12-2.89 mg. for the deficient group and 0.20-2.36 for the controls, in the test period 0.94-4.36 and 0.15-2.68 mg., respectively, and in the after period 0.98-2.24 and 0.16-1.76 mg., respectively. In the other two tests the response of the deficient group was not significantly different from that of the control.

Effect of pantothenic acid alone and in natural products on nutritional achromotrichia in rats, D. V. FROST, R. C. MOORE, and F. P. DANN (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 3, pp. 507-511, fig. 1).—In experiments designed to determine the anti-graying potency of liver and yeast extracts and to correlate this potency with the pantothenic acid content of the preparation as determined by chick and microbiological assay, certain samples were found to have a much higher anti-graying potency than the relative pantothenic acid content warranted. Certain liver extracts furnishing as small an amount as 40 μ g. daily of pantothenic acid were completely effective in restoring the natural color of the fur, while synthetic *d*-calcium pantothenate had a negligible effect. However, the

addition of the pantothenate to extracts low in this factor increased their anti-graying potency. Groups of young rats fed supplements of *d*-calcium pantothenate in amounts of 15, 30, 60, and 120 μ g. daily in addition to a highly purified diet grew proportionately to the dosage, but showed like susceptibility to graying, which occurred at about 7 weeks in all of the animals. The minimum requirement for optimal growth was in the neighborhood of 80 μ g. daily. Rats receiving this amount were raised to maturity, but successful matings were not observed.

Riboflavin.—Annotated bibliography supplement (*Rahway, N. J.: Merck & Co., 1941, pp. [2]+12*).—The material assembled under date of December 1941 supplements the previously noted bibliography (E. S. R., 85, p. 703).

The riboflavin content of fish products, F. L. BILLINGS, J. BIELY, H. FISHER, and C. HEDREEN (*Jour. Nutr.*, 22 (1941), No. 4, pp. 425-430).—Fifteen fish-liver meals, representing 13 species of fish, were prepared on a laboratory scale by thawing the samples (frozen upon collection), drying them in a vacuum at 50°-60° C., and removing most of the oil by pressure in a laboratory press. These, and 10 commercial fish meals and 19 byproduct (viscera, milt, roe, heads, "stick water") meals prepared on a laboratory or a semicommercial scale were subjected to microbiological assay by the method of Snell and Strong (E. S. R., 82, p. 587). The liver meals, containing from 52.1 to 101.4 μ g. of riboflavin per gram of moisture- and fat-free meal, were the richest of the materials examined, being comparable to liver meal from domestic animals. Viscera, roe, and stick water (a waste product of the wet process of producing fish meal) meals were next in value, containing from 26.7 to 55.7 μ g.; and milt and muscle (1 sample each) with 11.4 and 13.7 μ g. per gram of moisture- and fat-free meal were the lowest. The fish meals showed considerable variation (9.0-22.0 μ g. per gram of meal), probably due to different methods of manufacture and various types of material used.

Presence of a factor in blood which enhances bacterial growth activity of riboflavin, R. E. ECKARDT, P. GYÖRGY, and L. V. JOHNSON (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 3, pp. 405-409, fig. 1).—By destroying the riboflavin in blood by irradiating under alkaline conditions, neutralizing the treated blood, adding known amounts of riboflavin, and finally determining the riboflavin content of the samples thus treated by the Snell and Strong microbiological method (E. S. R., 82, p. 587), the authors have demonstrated the presence in blood of a substance which stimulates the growth of the organism in the presence of riboflavin but is without effect in its absence. It is suggested that materials to be assayed for riboflavin should first be tested to see whether or not this factor is present by destroying the riboflavin of a portion of the material by irradiation or absorption on Tonsil, a special fuller's earth with selective absorption for riboflavin. It is also emphasized that blood values should be redetermined in the light of these findings.

Ascorbic acid content of onions and observations on its distribution, E. F. MURPHY. (Maine Expt. Sta.). (*Food Res.*, 6 (1941), No. 6, pp. 581-594, figs. 5).—Reduced ascorbic acid, determined titrimetrically by the method of Bessey and King (E. S. R., 71, p. 137) in 16 varieties of fresh raw onions grown at Orono, Maine, and tested at intervals from August 1 to September 23, 1938, averaged from 0.17 mg. per gram for Crystal White Wax to 0.40 mg. per gram for Early Red Globe. Values for small immature onions were included in the computation of the averages. Ascorbic acid values of onions harvested early in the season while still small and straight were higher than those of subsequent samples. When a comparison was made of large and small onions of a given variety harvested on a given day, the small onions within a variety (in each of nine pairs of tests) contained significantly more ascorbic acid per gram than did the large ones. In general, varieties of onions which exhibited

a high average concentration of ascorbic acid consisted of a large proportion of small onions.

Analyses of the two outside leaves and of several younger smaller leaves of the bulb of mature onions from each of 10 pairs, each pair of a different variety, showed the ascorbic acid of the central portion to exceed that of the periphery in every case, the mean difference between the two sets of samples being 0.34 ± 0.04 mg. per gram. Actual ascorbic acid values for the central tissue varied from 0.14 to 0.73 mg. per gram; amounts in the peripheral tissue were from 14 to 59 percent as large as those in the central leaves, the actual values ranging from 0.04 to 0.13 mg. per gram. Differences between varieties were caused principally by variations in this central portion. Graphic data presented show that the ascorbic acid value falls as the onion matures, with consequent increase in the proportion of outer physiologically older tissue. Ten varieties analyzed as mature raw onions contained from 0.13 to 0.22 mg. of ascorbic acid per gram. These values are probably more representative than the varietal averages (0.17–0.40) given above of the ascorbic acid content of marketable onions as ordinarily utilized by the consumer.

Onions harvested in October, tied in bunches, and hung from rafters in a dry attic contained from 0.09 to 0.22 mg. of ascorbic acid after 1 mo. (a loss of 23–64 percent); and 0.06–0.18 mg. per gram at the end of the second and of the third months. Total loss during the 3 months varied from 47 to 80 percent. Cooking losses, upon boiling 25- to 30-gm. samples in 150 cc. of water for from 1 to 10 min., varied from 10 to 65 percent. The losses increased with length of cooking time.

Ascorbic acid (vitamin C) content of red raspberries preserved by the frozen-pack method, E. N. TOMLINTE and R. C. ROBBINS. (Wash. Expt. Sta.). (*Food Res.*, 6 (1941), No. 5, pp. 435–444).—The vitamin C contents of five varieties of frozen red raspberries were determined by biological assay in the seasons 1934–38 and by the chemical method (titration with 2,6-dichlorophenolindophenol) in the seasons of 1938 and 1939, when two additional varieties were also analyzed. The differences in ascorbic acid content of the varieties were of the same order in the two series of determinations, but in nearly all cases the values obtained by the titration method were higher. For the chemical determination on these pigmented fruits the method of McHenry and Graham (*E. S. R.*, 75, p. 572) was chosen, and the titration was carried out on extracts prepared by grinding the frozen fruit with acid-washed sand, using 3 percent metaphosphoric acid as the extracting agent. In 1939 the reliability of the end-point determination by this method was established through checks with photoelectric colorimetric determinations. In general there was good agreement of values by the two procedures, although the sugar-packed berries gave slightly higher values by the titration procedure. In these cases the end point of the titration was more difficult to see, due to the foaming and the more viscous nature of the solution.

On the basis of the titration values, the Antwerp variety averaged 0.35 mg. of ascorbic acid per gram of the frozen berries packed without sugar; the Washington variety contained 0.21 mg., and the other varieties (Cuthbert, Latham, Lloyd George, Marlboro, and Tahoma) from 0.15 to 0.19 mg. per gram. Since the raspberries were grown under comparable conditions of soil and climate, the differences are believed to be true varietal differences. Analyses in successive years indicated no seasonal variations. Comparison of fresh and frozen-pack raspberries of the same harvesting showed little difference in ascorbic acid on the moist-weight basis, but, when calculated to the dry basis the fresh berries contained more ascorbic acid.

Plasma vitamin C levels in a group of children before and after dietetic adjustment, D. F. MILAM and W. WILKINS (*Amer. Jour. Trop. Med.*, 21 (1941),

No. 3, pp. 487-491).—This study was undertaken because of the very low plasma ascorbic acid levels observed in the course of a nutrition survey in a rural cotton mill community in North Carolina. Of 218 individuals examined in the spring, 27 percent had no detectable ascorbic acid in the plasma and an additional 34 percent had levels under 0.3 mg. per 100 cc. Six cases of mild scurvy were found, all in subjects giving C values of 0.0-0.2 mg. per 100 cc. The present observations cover plasma ascorbic acid levels of 17 Negro and 17 white children from 5 to 17 yr. of age, at the beginning and end of a 6-week period at a summer camp where rich sources of vitamin C (orange or tomato juice, lettuce, slaw, and raw fruits and vegetables) were included in the daily diet. The initial values, determined on fasting blood with the Evelyn photoelectric colorimeter, ranged from 0 to 1.1, with an average of 0.28 mg. per 100 cc. and at the end from 0.5 to 1.7, with an average of 0.72 mg. per 100 cc. The values were 1.0 mg. per 100 cc. or above in 53 percent of the children. In only 3 instances was there no increase and in these the initial level was fairly high. The greatest gains occurred in the children with low initial levels.

It was concluded that the low initial levels in these children and in the larger survey group were not normal, but represented an inadequate diet over varying periods of time. "The reason for the absence of scurvy at these low levels might well be due to the intermittent ingestion of vitamin C foods, but in quantities too small and over periods too short to affect the blood serum levels."

Estimation of the ascorbic acid (vitamin C) requirement of ambulatory patients, G. A. GOLDSMITH, A. T. OGAARD, and D. F. GOWE (*Arch. Int. Med.*, 67 (1941), No. 3, pp. 590-596, fig. 1).—The method followed in this attempt to establish standards for comparison in estimating the vitamin C requirements of ambulatory patients consists in placing the subject on a diet low but not completely lacking in vitamin C, administering ascorbic acid in 100-mg. doses three times daily for 1 week and twice daily for another week to effect saturation, and continuing with 50 mg. daily for several weeks, with fasting plasma ascorbic acid determinations by the Farmer and Abt macromethod at weekly intervals throughout the test period.

Among a group of 12 clinic patients apparently normal with regard to vitamin C nutrition, the initial plasma ascorbic acid levels were below 0.4 mg. per 100 cc. in 5, but in 4 of these saturation was effected by the end of the first week. In the other 7 the first values were over 0.7 mg. per 100 cc. At the end of the first week the values were at least 1.4 mg. per 100 cc. in all but 1 of the 12 subjects. Normal levels were not reached in this subject until the end of the fifth week. At the end of 7 weeks all of the 12 subjects gave values of more than 1 mg. per 100 cc. At this time 2 subjects were returned to an unrestricted unsupplemented diet for 4 weeks, during which the concentration of ascorbic acid dropped to 0.45 and 0.30 mg., respectively. On resumption of the experimental diet supplemented with 50 mg. of ascorbic acid, the plasma values reached high normal in 1 and slightly subnormal (0.74 mg. per 100 cc.) in the other. At the end of the experiment 3 subjects who followed the regime for 15, 16, and 18 weeks gave plasma ascorbic acid values ranging from 2.05 to 2.45 mg. per 100 cc. As the diet was estimated to furnish about 20 mg. of ascorbic acid daily, the total intake on which these subjects remained saturated amounted to about 70 mg. daily.

Über das Vorkommen von Vitamin C im menschlichen Stuhl [The occurrence of vitamin C in human feces], H. MARTIN (*Klin. Wchnschr.*, 20 (1941), No. 12, pp. 287-289).—On ordinary unsupplemented diets the ascorbic acid content of the feces of two subjects, as determined by the method of Chinn and Farmer (*E. S. R.*, 83, p. 569), averaged 4.47 and 3.80 mg. daily. The daily addition of two oranges to the diet of one of the subjects had no appreciable effect on the

ascorbic acid content, the average for several days amounting to 4.62 mg. In studies conducted by the author on himself over a period of about a month, it was found that the ingestion of as much as 300 mg. of ascorbic acid resulted in no appreciable increase in the ascorbic acid content, but that following the intravenous injection of ascorbic acid the amounts recovered in the feces were proportional to the dosage.

Anemia in vitamin C deficiency and its response to iron, S. H. LIU, H. I. CHIU, T. F. YU, H. C. HSU, and T. Y. CHENG (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 4, pp. 603-606).—Anemia was found associated with vitamin C deficiency among boys in a municipal relief institution in Peiping, China. To determine a possible relationship between the two conditions, 16 of the boys showing varying degrees of anemia with low plasma ascorbic acid were divided into two groups, the members of one of which were given 50 mg. and of the other 1.5 gm. ferrous carbonate daily for 4 weeks without any change in diet or routine. Hematological and plasma ascorbic acid determinations at the beginning and end of the period were tested for significance by means of the *t* test.

The vitamin C therapy raised the plasma ascorbic acid in every instance, with an average increase from 0.23 to 0.91 mg. percent but with no or insignificant changes in the hematological blood values suggestive of anemia. Iron therapy was followed in most cases by significant increase in hematocrit, erythrocyte, and hemoglobin values, the average increases being from 32.8 to 37.3 percent, from 3.20 to 3.74 million per cubic millimeter, and from 9.2 to 12.1 gm. per 100 cc., respectively. It is concluded that the anemia was not due to lack of vitamin C, but was related in all probability to a concomitant iron deficiency.

Treatment of gingivitis with ascorbic acid, H. G. CAMPBELL and R. P. COOK (*Brit. Med. Jour.*, No. 4183 (1941), pp. 360-361).—The treatment of 14 cases of gingivitis with massive doses, 300 mg. daily, of ascorbic acid until urine tests showed saturation resulted in rapid improvement, the sore and inflamed gums becoming normal after about 4 days on the ascorbic acid treatment alone. On an average a total of 2,000 mg. of ascorbic acid was required for saturation as determined by the presence of 5 mg. or more of ascorbic acid per 100 cc. in samples of urine collected approximately 6 or at the latest 12 hr. after the test dose. After saturation a maintenance dose of 100 mg. daily is recommended. It is noted that even after the gums have returned to a normal healthy condition firm pressure will result in some bleeding from the interdental papillae between the lateral incisors and canines. The suggestion is made that this persistent bleeding may be associated with lack of a factor, possibly vitamin P, capable of restoring capillary permeability to normal.

The distribution of vitamin E in products of cereal milling, D. S. BINNINGTON and J. S. ANDREWS (*Cereal Chem.*, 18 (1941), No. 5, pp. 678-686).—Tocopherols were determined in the nonsaponifiable portion of oils extracted from the milled products of hard and durum wheats as obtained from a single large mill. Results by the chemical method, involving chromatographic fractionation of the nitric acid oxidation products upon activated alumina, were checked against those obtained by biological assay. The close correlation of results by the two methods suggested that vitamin E was present substantially as α -tocopherol. The two types of wheat contained about the same amounts of vitamin E, although the distribution within the kernels differed. In both wheats about 55 percent was in the embryo. In the hard wheat, the remainder was found in the endosperm layers closely adjacent to the bran, this latter tissue together with the bulk of endosperm constituting patent flour being practically free from the vitamin. In durum wheat, the nongerm tocopherol was fairly uniformly distributed throughout the endosperm, the semolina containing appreciable amounts.

Additional observations on vitamin K-deficient diets, S. ANSBACHER (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 3, pp. 421-424).—The vitamin K-deficient ration, K-11, containing pantothenic acid, permits better growth of the test animals and an earlier incidence of the hemorrhagic diathesis than is obtained with ration K-7 previously described (*E. S. R.*, 85, p. 714). It is pointed out that vitamin K is apparently a growth factor, since chicks lose weight when the deficiency symptoms occur and grow faster on ration K-11 supplemented with vitamin K than on ration K-11 alone. This ration is composed of a heated grain mixture (wheat middlings 25 and yellow corn 58 percent, heated for 1 week at 120° C.) 83 percent, Smaco vitamin-free casein 12, salt mixture (*E. S. R.*, 83, p. 12) 2, calcium carbonate 1, and cod-liver oil 2 percent, and each 10 kg. of ration is supplemented with 80 mg. each of thiamin hydrochloride, riboflavin, and pyridoxin hydrochloride; 1 gm. each of calcium pantothenate, nicotinic acid, and inositol; and 3 gm. each of choline chloride and *p*-aminobenzoic acid. Vitamin K activity was determined for bananas and for a number of quinone derivatives in bio-assays, using this special diet. The results reported showed that fresh ripe bananas (used in prophylactic tests) were devoid of vitamin K and did not contribute to vitamin K synthesis.

Vitamin K and the prenatal and postnatal prevention of hemorrhagic disease in newborn infants, F. S. BRUCHSALER (*Jour. Ped.*, 18 (1941), No. 3, pp. 317-320, fig. 1).—In the method described clotting rate is used as a measure of prothrombin level. Ten mm.³ of unoxalated blood obtained by finger or heel (in infants) puncture are added, with stop watch timing, to 10 mm.³ of thromboplastin solution in a hollow slide. A needle is dipped into the mixture every 2 sec. until the first strand of fibrin is observed. The prothrombin time noted at this interval is calculated as percentage of normal time, as determined in the same fashion on normal blood. Determinations by this method on a group of 30 normal infants gave averages of 58.3, 54.4, and 57.1 percent on the first, fourth, and sixth days of life, respectively, thus confirming the physiologic hypoprothrombinemia in normal newborn infants, followed by rapid return to adult levels. In another group of 30 normal newborn infants who received vitamin K concentrate for the first 6 days, the averages for the first, third, fourth, and sixth days, respectively, were 59, 70.9, 80.9, and 84.4 percent. Ten infants from mothers receiving vitamin K while in labor and during the first 6 days after delivery showed averages of 63.3 and 75.3 percent on the first and second days, respectively, and 83 percent on the fourth, fifth, and sixth days.

Clinical studies with vitamin K in newborn infants, P. S. ASTROWE, E. S. PALMERTON, and V. HENDERSON (*Jour. Ped.*, 18 (1941), No. 4, pp. 507-515).—Prothrombin clotting times by the method of Kato (*E. S. R.*, 84, p. 568) were determined on 54 infants during the first week of life and on their mothers. The infants represented three groups, namely, untreated control cases, infants receiving vitamin K (2 cc. of a liquid concentrate containing 1,250 Almquist units per cubic centimeter), and those whose mothers received 6 cc. of the concentrate with 6 gr. of bile salts during labor. The data on clotting times, presented in detail and by summary, showed elevated prothrombin times of the infants at birth, with an increase in the untreated cases during the first few days of life, returning to normal by the fourth or fifth day, but with no such increase in the infants receiving vitamin K. Mothers receiving vitamin K at least 12 hr. before delivery transmitted some of the vitamin to their infants, as shown by the inhibition of the upward swing in the prothrombin clotting time. No relationship was established between the diets of the mothers and the prothrombin times of their newborn infants. A normal clotting time on the part of the mother did not preclude an increase in clotting time in the

infant. It is recommended, therefore, that "mothers should be given vitamin K ante partum, and the newborn infant should be given similar medication during the first 24 hr."

Antepartum use of vitamin K in the prevention of prothrombin deficiency in the newborn. G. P. BOHLENDER, W. M. ROSENBAUM, and E. C. SAGE. (Univ. Nebr.). (*Jour. Amer. Med. Assoc.*, 116 (1941), No. 16, pp. 1763-1766, figs. 2).—Evidence is presented to indicate that a vitamin K preparation (4-amino-2-methyl-1-naphthol hydrochloride) given intravenously to the mother before delivery effectively prevented prothrombin deficiency in the infant. The time of administration of the vitamin K preparation apparently made no difference in the results obtained in the series of infants observed. Routine prophylactic administration of vitamin K to the mother is considered a desirable measure, particularly when the infant is likely to be premature, if labor is prolonged, and if operative delivery of any type is anticipated.

Vitamin P and capillary fragility. H. G. RAPAPORT and S. KLEIN (*Jour. Ped.*, 18 (1941), No. 3, pp. 321-327, figs. 6).—Capillary fragility tests by the positive pressure method were made on 100 children attending a pediatric allergic clinic. Of the entire group, 51 had normal capillary fragility by the Wright standards. Of the 49 with abnormal fragility, 12 who showed consistently abnormal fragility on repeated tests were given 100 mg. daily of vitamin P in divided doses and tested at periodical intervals for 6 mo., during which the therapy was frequently omitted. Blood ascorbic acid determinations were made routinely, and when the levels were found to be below normal ascorbic acid was administered by mouth until normal levels were obtained. No ascorbic acid data are reported. In all of the children capillary fragility returned to normal with vitamin P therapy and became abnormal again with cessation of the treatment. In some the change took place almost immediately and in others after some delay. These findings are thought to support the suggestion made in an earlier report (E. S. R., 84, p. 852) that vitamin P plays an important role in the maintenance of the normal capillary wall.

Round table discussion on anemias of infancy (*Jour. Ped.*, 18 (1941), No. 4, pp. 538-563, figs. 5).—The following three papers were presented for discussion before the tenth annual meeting of the American Academy of Pediatrics: Development of the Blood and Changes in the Blood Picture at Birth, by W. F. Windle (pp. 538-550); Anemias of the Newborn Infant, by R. A. Strong (pp. 550-556); and Anemia of Late Infancy, by A. F. Abt (pp. 556-563).

The pediatric aspect of dental conditions in childhood. A. F. ABT (*Arch. Ped.*, 58 (1941), No. 4, pp. 210-227, figs. 2).—This general discussion includes, in addition to many other topics, sections on the effects of general faulty nutrition and specific nutritional deficiencies (particularly lack of vitamins A, C, and D) on the normal growth and development of the teeth, and a brief section summarizing the present theories on the etiology of dental caries. Concerning the latter, three points are emphasized as the most recent advances in the subject—(1) that vitamin D is indicated in plentiful amounts not only in early infancy but also from childhood through adolescence, (2) that the slogan "a clean tooth never decays" is now outlawed, and (3) that "the overloading of calcium and phosphorus preparations upon children suffering with caries now seems to be a rather antiquated remedy due to be discarded," although it is emphasized that "every child should naturally receive an adequate amount of calcium and phosphorus in a balanced dietary."

TEXTILES AND CLOTHING

[Textile materials] (In 1941 Supplement to A. S. T. M. Standards, including Tentative Standards.—Part III, Nonmetallic Materials—General. Philadelphia:

Amer. Soc. Testing Materials, [1941], pp. III, 141-184, 526-583, figs. 16).—"This second supplement to Part III on Nonmetallic Materials—General—of the 1939 Book of A. S. T. M. Standards contains the newly adopted and revised standards and the new and revised tentative standards in the general nonmetallic materials field that have been accepted since the appearance of the first supplement issued in November 1940." Standards applying to textile materials include (1) definitions of terms relating to textile materials; (2) specifications (and tests) for textile testing machines, fire-retardant properties of treated textile fabrics, asbestos roving and tape for electrical purposes, bleached cotton broadcloth, medium-weight cotton corduroy, and fineness of wool tops; and (3) methods for the following: Identification of fibers in textiles; quantitative analysis of textiles; testing for fastness of colored textiles to light; testing resistance of textile fabrics and yarns to insect pests; evaluating compounds designed to increase the resistance of fabrics and yarns to insect pests; testing tubular sleeving (including asbestos sleeving) and braids (with tolerances); testing for thickness of solid electrical insulation; testing dyed or printed cotton textiles for fastness to laundering or domestic washing; testing (and tolerances for) cotton yarns, single jute yarns, and woven glass fabrics and tapes; testing for staple rayon; testing for commercial weight of continuous filament rayon yarns, and spun rayon yarns and threads; and testing for hard scoured wool in wool in the grease.

Cross sectioning of textile materials by hand without microtome or other special equipment, H. N. LEE and E. R. SCHWARZ (*Textile Res.*, 11 (1941), No. 8, pp. 303-367, figs. 5).—The methods described consist fundamentally of impregnating a tuft or bundle of fibers or fabric with a material of such stiffness and tenacity that the fibers will be held in position during the cutting operation. Synthetic resins, such as isobutyl methacrylate (dissolved in xylol), gum arabic (dissolved in a water-glycerine-ethyl alcohol mixture), and plasticized collodion are recommended as satisfactory impregnating materials. By the procedure described, sections as thin as can be made by a microtome may be cut directly by hand with ordinary razor blades. For thinnest sections of uniform thickness the use of a microtome is desirable, however.

Microscopic structure of the wool fiber, C. W. HOCK, R. C. RAMSAY, and M. HARRIS (*Textile Res.*, 11 (1941), No. 10, pp. 415-428, figs. 16).—Essentially noted elsewhere (E. S. R., 86, p. 568).

The rôle of cystine in the structure of the fibrous protein, wool, W. I. PATTERSON, W. B. GEIGER, L. R. MIZELL, and M. HARRIS (*Textile Res.*, 11 (1941), No. 9, pp. 379-393, figs. 4).—Essentially noted from another source (E. S. R., 86, p. 568).

Oxidation of wool keratin by potassium permanganate, M. BARR and R. EDGAR. (Iowa State Col.). (*Textile Res.*, 11 (1941), No. 10, pp. 429-437).—According to the authors' abstract, "the degradation of wool by 50 volumes of 0.0100 to 0.0400 M potassium permanganate, by 50 volumes of 0.0100 to 0.0600 M potassium permanganate, 0.1800 N as to sulfuric acid, and by 62.5, 75.0, and 100 volumes of 0.0200 M potassium permanganate, both aqueous and acidic, in 10 hr. at $40^{\circ} \pm 0.1^{\circ}$ C. has been measured by the weight, nitrogen, total sulfur, sulfate sulfur, and wet strength of the residual wool. Percentage losses in weight, nitrogen, and nonsulfate sulfur have been shown very similar in 50-volume baths of either aqueous or acidic permanganate in the same molarity. With increasing volume of 0.0200 M potassium permanganate, loss of nitrogen by wool has been shown greater in acidic than in aqueous solutions. In no case did the wool's sulfate sulfur increase, although part of its original sulfate sulfur dissolved in acid permanganate. Wet strength of wool has been shown to decrease more

rapidly than weight, nitrogen, or nonsulfate sulfur with increasing molarity or volume of permanganate and more rapidly in aqueous than in acidic permanganate."

Photochemical reactions in silk, H. A. RUTHERFORD and M. HARRIS (*Textile Res.*, 11 (1941), No. 9, pp. 394-402).—According to an authors' abstract, "silk is more readily deteriorated by the action of light than any other natural textile fiber. While the nature of the deterioration has not been clear, it has been known that the rate of decomposition may be considerably altered by pretreatment of the fiber with solutions of various chemical compounds. For example, silk treated with dilute solutions of basic compounds is more stable toward the action of light than untreated silk, whereas silk treated with dilute solutions of mineral acid exhibits greatly decreased stability under the same conditions. An investigation by research associates of the Textile Foundation at the National Bureau of Standards of the influence of a number of reagents on the photochemical deterioration of silk now reveals that the rate of deterioration is in part influenced by the cationic content of the silk. The removal of cationic substances, by two independent methods, results in practically identical decreases in the stability of the fibers to light. On the other hand, the stability is readily restored by treatment with basic compounds. Inorganic bases produce a number of undesirable effects, such as a harsh 'feel' and a tendency for the cloth to yellow. These effects can be eliminated by the use of any one of a number of different organic basic compounds.

"It was further shown that the inactivation of the carboxylic acid groups of silk by methylation with diazomethane does not appreciably change the photochemical behavior of the fiber, but that the methylation of only a small percentage of the hydroxyl groups of tyrosine results in a marked increase in photochemical stability. The results suggest that alteration of the tyrosine hydroxyl groups by reaction with various reagents is responsible for at least part of these stabilizing effects."

HOME MANAGEMENT AND EQUIPMENT

What the farm should contribute toward family living, A. E. ORR ET AL. (*Washington Sta. Pop. Bul.* 163 (1941), pp. 43, figs. 9).—This bulletin gives practical consideration to the farm production of fruits, vegetables, eggs, meats, cereals, milk, and milk products in sufficient quantities to meet the needs of the farm family for a good diet. Suggestions given are in terms of working plans for gardening and for harvesting and storage of fruits and vegetables and for housing, care, and feeding of farm animals for economical production of dairy and poultry products and meats.

The income of Columbia families, J. V. COLES and E. MCGUIRE (*Missouri Sta. Bul.* 438 (1941), pp. 65-66).—Progress reports are given.

Changes in assets and liabilities of families: Five regions. Urban, village, farm, D. S. BRADY, D. MONROE, J. MURRAY, Y. A. CARMEL, and M. W. ELLSWORTH (*U. S. Dept. Agr., Misc. Pub.* 464 (1941), pp. V+226, figs. 5).—This deals with a year's changes in the assets and liabilities of selected groups of families at different income levels living in 20 small cities, 140 villages, and 13 type-of-farming sections in 64 counties of 5 regions as surveyed by the Bureau of Home Economics in the consumer purchases study (*E. S. R.*, 84, p. 856).

Family expenditures for clothing: Five regions. Urban and village series, M. Y. PENNELL, D. MONROE, K. CRONISTER, G. S. DUPUY, and M. W. ELLSWORTH (*U. S. Dept. Agr., Misc. Pub.* 422 (1941), pp. III+329, figs. 6).—In continuation of this series of reports (*E. S. R.*, 86, p. 141), information is given concerning the clothing expenditures of families living in the villages and small cities in five regions. The patterns of clothing expenditures by income and by family compo-

sition are traced for families in the group of villages in the Middle Atlantic and North Central regions, and a brief comparison of this unit with the others is given for native white families. A discussion of family outlays for dress for Negroes is also given. The more detailed discussion of use of clothing funds—garments bought and prices paid—by each of 11 groups of family members is presented for villages in the North and West.

Family expenditures for personal care, gifts, selected taxes, and miscellaneous items: Five regions. Urban, village, farm, D. MONROE, D. S. BRADY, E. D. RAINBOTH, and E. D. RILEY (*U. S. Dept. Agr., Misc. Pub. 455 (1941), pp. III+113, figs. 2*).—This report is in continuation of the series on expenditures for major budget categories of selected urban, village, and farm families in five major regions (*E. S. R.*, 85, p. 284; 86, p. 141). The categories of family consumption considered in the present volume accounted for only about 5 percent of the total value of consumption of most income groups in the farm sections surveyed and for a slightly larger proportion, but generally less than 7 percent, in villages and small cities.

Family expenditures for housing and household operation: Five regions. Farm series, H. KYRK, D. MONROE, D. S. BRADY, C. ROSENSTIEL, and E. D. RAINBOTH (*U. S. Dept. Agr., Misc. Pub. 457 (1941), pp. V+201, figs. 4*).—This report, dealing with expenditures for housing and household operation of families living in the farm sections surveyed by the Bureau of Home Economics as a part of the consumer purchases study, is comparable to an earlier report on such expenditures by small city and village families (*E. S. R.*, 85, p. 862). Details of expenditures are discussed for one group of counties in the general farming section of Pennsylvania and Ohio, and similarities and differences between the patterns found in this unit and the others are discussed briefly. Negro and sharecropper groups in the Southeast are considered.

MISCELLANEOUS

The publications of the United States Department of Agriculture and the policies covering their distribution, M. C. MERRILL (*U. S. Dept. Agr., 1941, pp. [1]+23*).—This is a paper delivered before the public documents committee of the American Library Association. An appendix lists publications and periodicals which have been discontinued.

Highlights of the work of the Mississippi Experiment Station: Fifty-fourth Annual Report for the fiscal year ending June 30, 1941, C. DORMAN (*Mississippi Sta. Rpt. 1941, pp. 59, figs. 14*).—This consists mainly of a reprint of articles previously noted (*E. S. R.*, 86, pp. 443, 447, 449, 467, 477, 520, 572, 772, 776, 811, 816, and 817).

Mississippi Farm Research, [February 1942] (Miss. Farm Res. [Mississippi Sta.], 5 (1942), No. 2, pp. 8, figs. 7).—In addition to articles noted previously or elsewhere in this issue, this number contains Beef Production of Holly Springs Branch Station, by E. B. Ferris (pp. 1, 5); Attractive Home Grounds Inspire Morale for Victory, by F. S. Batson (p. 1); Southern Agriculture in a Changing World, by C. Dorman (pp. 1, 2); and Southern Farm Forests, by R. R. Reynolds (p. 7).

Investigations of agricultural problems: Work of the [Missouri] Agricultural Experiment Station during the year ending June 30, 1938, F. B. MUMFORD, S. B. SHIRKY, ET AL. (*Missouri Sta. Bul. 438 (1941), pp. 103, figs. 12*).⁵

Fifty-fourth Annual Report [of Cornell Station], 1941, C. E. LADD ET AL. (*[New York] Cornell Sta. Rpt. 1941, pp. 76-202*).⁵

⁵ The experimental work not previously referred to is for the most part noted elsewhere in this issue.

NOTES

Connecticut [New Haven] Station.—The station's new brick building, which includes an auditorium and garage, is now in use. Specially designed laboratories for the genetics and entomology departments are other features of the building. Of the 11 laboratory rooms, 9 are equipped with apparatus to control temperature and humidity.

Dr. M. F. Morgan, agronomist in charge of the soils department, has been called to active duty as lieutenant colonel of infantry. During his absence Dr. Herbert A. Lunt, associate in forest soils, will be acting head of the department. Edward Rubins has been appointed research assistant in soils.

Purdue University and Indiana Station.—Dean Emeritus John H. Skinner died April 28 at the age of 68 years. A native of Indiana, he was graduated from the university in 1897, and, aside from a year at the University of Illinois as instructor in animal husbandry in 1901-2, he spent practically his entire subsequent life in its service. From 1902 to 1907 he was head of the department of animal husbandry; from 1907 to 1927, dean of the School of Agriculture; and from 1928 to 1940, dean of the school and director of the station and extension work. In these capacities he had a wide acquaintance and influence, especially among livestock interests in the Middle West. Under his leadership the School of Agriculture and the station also made much progress. In recognition of his work he was given the honorary degree of doctor of agriculture by the Michigan College in 1935.

On April 30 occurred the death of Dr. Joseph C. Arthur, widely known as a pioneer botanist, at the advanced age of 92 years. Dr. Arthur, a native of Lowville, N. Y., received from the Iowa College the B. S. degree in 1872, the M. S. degree in 1877, and the Sc. D. degree in 1920, as well as the Sc. D. degree from Cornell in 1886 and Purdue in 1931 and the Ll. D. degree from the University of Iowa in 1916. He had also studied at Johns Hopkins and Harvard and Bonn Universities. From 1879 to 1882 he was instructor in botany in the Universities of Wisconsin and Minnesota, and from 1884 to 1887 botanist at the New York State Station. Coming to Purdue in the latter year as professor of botany, he continued to head the college botanical work until his retirement in 1915 as professor emeritus. He was also the first botanist in the station, serving from 1888 to 1915. During this period Dr. Arthur and his students won world-wide fame for their contributions on plant rusts. He was responsible for establishing the Arthur Herbarium, which contains over 60,000 specimens of plant rusts from all over the world.

A program of research dealing with brucellosis in swine has been initiated in the department of veterinary science as a part of a coordinated program in the U. S. D. A. Bureau of Animal Industry and several of the Corn Belt experiment stations.

Maryland University and Station.—Dr. J. B. S. Norton, professor of plant pathology and plant pathologist and botanist in the station and associated with the institution since 1901, retired April 1 as professor emeritus.

Association of Land-Grant Colleges and Universities.—Announcement is made that the fifty-sixth annual convention of the association will be held in Chicago from November 16 to 18, 1942. Preconvention dates for November 12-15 are also scheduled.

EXPERIMENT STATION RECORD

VOL. 87

August 1942

No. 2

SOME SIGNIFICANT FINDINGS OF THE EXPERIMENT STATIONS IN 1941 (PART 2)

The following items supplement and conclude the article previously presented (E. S. R., 87, p. 1).

Measuring the air capacity of the soil was found by the Ohio Station to give important information on soil condition in relation to the yield of sugar beets, particularly on heavy soils. The air capacity of plats treated differently ranged from 2.6 to 25.3 percent, while sugar beet yields ranged from 1.5 to 18.7 tons per acre, respectively. The addition to the soil of organic matter and mulching and ridging the soil were found to increase its air capacity.

The New York State Station has found that pasteurization of the cheese milk in the manufacture of various foreign-type cheeses, particularly Limburger, has made it possible to control the bacterial flora and the gas production. These findings have led to marked improvement in the quality of the product. Improved methods for producing the molds used as inoculum for Roquefort-type or blue cheese have been developed by the Minnesota Station which enabled the development of the characteristic flavor in 3 to 5 mo., thus materially reducing the ripening period and permitting earlier marketing of the finished product.

Determinations of the amount of soil moisture were found by the Michigan Station to be obtained readily without disturbing the soil by measuring the electrical resistance of plaster-of-paris blocks embedded in it. One sugar company has installed 5,000 of these blocks in its beet fields to show when to irrigate and how much water to apply.

A substance, which has been named actinomycin, has been isolated by the New Jersey Station and found to have a strong inhibiting effect on all soil fungi and bacteria, and a strong killing effect upon a variety of bacteria.

Arsenic accumulations in orchard soils from spraying, to an extent handicapping the use of such soils for field crops when the trees are removed, have been found by the Washington Station to be successfully overcome in soils only mildly toxic by mixing the topsoil and subsoil. With soils of medium to high toxicity, treatment with fer-

rous sulfate and/or phosphate was a beneficial supplementary measure.

In an attempt by the Alaska Station to utilize native feedstuffs, breeding ewes in good condition were wintered on native hay or oat-pea hay, producing good wool clips and lamb crops. Oat-pea silage, however, when fed exclusively, failed to support normal gestation.

Injections of ascorbic acid, the pure form of vitamin C, were found by the Wisconsin Station to be a practical method of rejuvenating impotent bulls and promoting pregnancy in cows which had failed to conceive before treatment.

In studies of the conservation of major fertilizer elements, the Alabama Station found that much loss of nitrogen could be prevented by deferring the turning under of summer legumes until spring. The use of winter cover crops following fall-turned legumes reduced losses of nitrogen and potash very materially.

Following studies by the New York (Cornell) Station of gas storage of apples, four commercial fruit-storage concerns in New York held about 50,000 bushels of apples under modified atmosphere with eminent success. The New Hampshire Station held McIntosh apples in excellent condition 3 to 4 mo. past the normal season in modified atmospheres under ordinary refrigeration. This discovery should be of benefit both to growers and the consuming public, as the station finds that the late winter demand for McIntosh can be increased if the fruit reaches the consumer in good condition. Some success in controlling scald on other varieties was obtained by passing the storage air through a bath of mineral oil, after removing excess carbon dioxide.

A hitherto unknown factor in the spread of bovine mastitis has been found by the Florida Station to be its transmission by common houseflies and frit flies or eye gnats. These insects feed at the teat opening and carry infection thus picked up from infected animals to others which are then infected through the teat canal. The same station has also found that injections of iodized mineral oil (1:1,000 solution of U. S. P. resublimed idoine crystals in U. S. P. liquid petrolatum) into the teat canals have been followed by a cessation of the shedding of bacteria.

Strychnine sulfate has been found by the Wyoming Station to be very helpful in combating poisoning of sheep due to eating a species of lichen.

The use of a "new-type" vaccine prepared by the Nevada Station, which gives immunity against hemorrhagic disease (bacillary hemoglobinuria) for a much longer period than vaccines previously used, has been followed by the death of only 7 head of cattle and 1 horse out of over 15,000 cattle and 2,344 horses treated. Its effectiveness appears to continue through an entire pasture season and possibly up to a year.

Ketosis, a disorder of dairy cows with a rather high mortality and slow recovery of surviving animals, has been effectively counteracted by the Connecticut (Storrs) Station through the administration of glucose by mouth or stomach tube.

Sulfathiazole, administered at the rate of 0.25–1 gm. per ounce of ration, has been found by the Rhode Island Station to be nontoxic to chickens and effective in preventing and curing infectious coryza (rhinitis). The results are of general scientific interest because of the similarity of the causative organisms to the blood-inhabiting group of organisms pathogenic to man and animals.

The California Station has identified two additional nutritive factors essential for normal growth and reproduction of chickens. One of these factors, present in polished rice, has proved to be composed of glycine or one or more pentose sugars. The other, active in preventing perosis or slipped tendon, has been identified as choline, and it has been found that gizzard erosion is directly related to failure of normal cholic acid production by the birds. Knowledge of the chemical identity of these factors will permit the working out of more complete diets and the more exact diagnosis of causes of nutritive inadequacies.

A new use for cotton and a substitute roofing material are recent developments in Mississippi. The station has solved some of the difficulties encountered by a neighboring cotton farmer in an attempt to make shingles from a mixture of sand, cement, and cotton. Quick setting, good reinforcement, and more rapid curing have been achieved. About 10 lb. of cotton are used per square of shingles, and it has been found practicable for farmers to make and lay their own shingles by this process.

A portable grain drier has been developed by the Maryland Station, in cooperation with the Department, which effectively dries grain combined during adverse weather. General use of the drier should result in considerable decrease of grain spoilage by heating and mold, facilitate the ever-normal granary plan, and prove especially valuable when shipping facilities are inadequate.

In a study by the Arkansas Station of the possible use of locally available farm materials and labor in house construction, a number of 4-room cottages have been built mainly with lumber and labor from the farm. The total cash outlay for purchased materials was reduced to about \$400, of which more than one-half was spent for utilities and equipment.

Fluorine in well water and other water supplies used for drinking and cooking has been found by the Arizona Station to be the main cause of mottled teeth, and means for removing this element have been worked out. Only small amounts were found in vegetables

and other foods raised on soils containing this element, but it was absorbed on cooking in fluorine-containing water. Milk from cows drinking such water carried only a harmless trace. These findings point the way to greater safety for those living in communities with water supplies containing excessive fluorine.

Surveys of apple sales by over 1,500 independent and chain stores in New York City, carried on by the New York (Cornell) Station in cooperation with the Department, showed that growers must develop ways and means to work with independent stores if low-income consumers in that city are to be reached. Sales of fresh fruit in March 1940 in low-income areas were only about one-third of the sales in high-income areas, while the canned fruits and fruit juices ratio was about 1:5. Better adaptation of grade standards to consumers' requirements, education of clerks and housewives as to the merits of different fruits, and better coverage of fruits offered for sale in the medium- and low-income areas appear to be possible means of bringing about more effective distribution of surplus supplies of fruits.

Approximately one-half of the rural population of Virginia are classified by the Virginia Station as on a bare subsistence basis and therefore marginal as to income, living standards, and education. From one-tenth to one-fifth are submarginal or bordering thereon. The marginal white families have about one-third more children than an equal number of families from higher-income groups. Much of the State's crime bill is traceable to the marginal-standard group, which is not reached by many public agencies. The data secured through this study are being used by many types of agencies and have caused modifications and intensification of their programs.

In studies of the incomes and expenditures of farm and village families by the Vermont Station, in cooperation with the Department, a higher standard of housing was associated with higher income, while increased numbers in the families of stationary income brought decreases in the housing standard. Consumption of protective foods (vitamins and minerals) tended to increase with growth of income.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical investigations by the Delaware Station] (*Delaware Sta. Bul.* 235 (1941), pp. 18-19).—This report notes a public service patent on jellying pectin compositions granted to G. L. Baker and M. W. Goodwin, and investigations on partial demethylation of pectin and on the effect of the inversion of sugar on jelly strength, both by Baker and Goodwin.

[Chemical investigations by the Iowa Station] (*Iowa Sta. Rpt.* 1941, pts. 1, pp. 31-32, 98-99, 101-102, 107-109, 116; 2, pp. 60-64, 64-67).—This report notes in part 1, work on production of derivatives of sterols and their role in nutrition, by L. Yoder, B. H. Thomas, and J. C. Eck; and recovery of valuable byproducts from poultry wastes (manure, blood, feathers, eggshells, incubator rejects, viscera, heads, feet, and whites), by G. F. Stewart.

In part 2, certain chemical and physical characteristics of corn as these relate to industrial utilization are noted by R. M. Hixon, W. G. Gaessler, and G. F. Sprague; oxidation of cornstarch, methylation and hydrolysis of oxidized starch, methylation of sodium starch, and methylation of dextrin acids, identification of the compounds responsible for the odor of yellow corn, fractionation and characterization of corn protein, elasticity and viscosity of starch characteristics, development of laboratory control technics for cornstarch production, and physical properties of dextrins isolated from corn sirup, all by Hixon; X-ray and microscopic studies on starch, and electrical studies on starch, both by R. S. Bear; Raman spectra of sugars, dextrins, and starches, by F. H. Spedding and Hixon; and utilization of agricultural products in the fermentative production of lactic acid, by C. H. Werkman.

[Chemical investigations by the Puerto Rico University Station] (*Puerto Rico Univ. Sta. Rpt.* 1941, pp. 14, 41-42, 59).—This report notes experiments on utilization of native fruits and sugarcane juice in the fermentation industries, by R. Arroyo, F. Marrero, and L. Igaravidez; a study on the prevention of rancidity of coconut cream by an extract of rolled oats, by D. H. Cook, J. H. Axtmayer, and J. A. Goyco; and chemical studies of local lards and oleomargarines, by J. H. Ramirez.

The boundary tension of gallium, G. L. MACK, J. K. DAVIS, and F. E. BARTELL. (N. Y. State Expt. Sta. et al.). (*Jour. Phys. Chem.*, 45 (1941), No. 5, pp. 846-851).—The surface tension of pure gallium in an atmosphere of hydrogen or of carbon dioxide was found to be 735 ± 20 dynes per centimeter between 30° and 40° C. The interfacial tension against 0.1 N and 0.2 N hydrochloric acid was 636 ± 2.6 dynes per centimeter at 35°.

Bound water in plant sap and some effects of temperature and nutrition thereon, R. C. CHANDLER. (Univ. Calif.). (*Plant Physiol.*, 16 (1941), No. 4, pp. 785-798, figs. 4).—From a cryoscopic study of the sap of hardened and unhardened wheat plants and of artificial solutions colloidal and noncolloidal, the author concludes that the quantity of "bound" water in plant sap, as determined by colligative methods, is a reflection of all the components of the sap and of the reference substance where such is used, a hypothetical quantity

estimated to account for the difference in value of a property of water in complex solution and its value in simple solution. Water in sap seems to have the normal properties of water found in any complex solution. Changes in the thermodynamic activity of water in sap as plants harden may be accounted for most satisfactorily by the quantitative and qualitative changes in solutes as a result of physiological response to environment.

Heavy carbon as a tracer in heterotrophic carbon dioxide assimilation, H. G. WOOD, C. H. WERKMAN, A. HEMINGWAY, and A. O. NIER. (Iowa Expt. Sta. coop. Univ. Minn.). (*Jour. Biol. Chem.*, 139 (1941), No. 1, pp. 365-376).—By the use of C^{13} as a tracer, carbon dioxide fixed in the fermentation of galactose, pyruvic acid, and citric acid by coli bacteria was shown to occur solely in the succinic and formic acids. In the fermentation of glycerol and glucose by *Propionibacterium*, the fixed carbon dioxide is in the succinic acid, propionic acid, and propyl alcohol. The data support the suggestion that succinic acid is formed by union of a 3-carbon compound with carbon dioxide, the propionic acid by decarboxylation of a symmetrical dicarboxylic acid containing fixed carbon dioxide in one carboxyl group only. According to this concept all the carbon dioxide is fixed originally by union of 3- and 1-carbon compounds.

Heats of combustion.—I, The heat of combustion of acetone, C. B. MILES and H. HUNT. (Purdue Univ.). (*Jour. Phys. Chem.*, 45 (1941), No. 7, pp. 1346-1359, figs. 4).—The authors present a redetermination of a value last reported upon in 1911, describing their experimental set-up and technique in detail.

Recent advances in the chemistry of the proteins, D. C. CARPENTER. (N. Y. State Expt. Sta.). (*Jour. Chem. Ed.*, 18 (1941), No. 6, pp. 274-276, figs. 3).—This is a concise review of applications of such recently developed techniques as that of the ultracentrifuge, X-ray spacing measurements, ultraviolet photolysis, etc., theories of protein structure included being those of the union of peptide chains by hydrogen-bond linkage, cyclol formation, and hydrogen-bond linkage of ketopiperazine rings.

Combination of proteins and metaphosphoric acid, G. E. PERLMANN (*Jour. Biol. Chem.*, 137 (1941), No. 2, pp. 707-711).—The author reports experiments showing that a variety of proteins combine with metaphosphoric acid to form an insoluble precipitate in which the phosphorus content is equivalent to the number of positively charged groups of the protein.

The isolation of lanthionine from human hair, chicken feathers, and lactalbumin, M. J. HORN and D. B. JONES. (U. S. D. A.). (*Jour. Biol. Chem.*, 139 (1941), No. 1, p. 473).—Lanthionine has been isolated from hair, from chicken feathers, and from the nonkeratinous protein lactalbumin. It is, therefore, considered probable that lanthionine may be similarly obtained from most proteins which yield cystine on acid hydrolysis.

The synthesis of S-(β -amino- β -carboxyethyl)-homocysteine, G. B. BROWN and V. DU VIGNEAUD. (Cornell Univ.). (*Jour. Biol. Chem.*, 137 (1941), No. 2, pp. 611-615).—The authors record a synthesis of the thio ether, S-(β -amino- β -carboxyethyl)-homocysteine through the reaction of α -amino- β -chloropropionic acid with homocysteine in strongly alkaline solution.

Purification of prothrombin and thrombin: Chemical properties of purified preparations, W. H. SEEGER (*Jour. Biol. Chem.*, 136 (1940), No. 1, pp. 103-111, figs. 3).—Prothrombin possessing 300 units of activity per milligram of dry weight and thrombin of 600 units of activity per milligram of dry weight were obtained as routine products by the technique described. Products possessing as much as 520 and 950 units per milligram, respectively, have been obtained.

Evidence indicating that prothrombin and thrombin are carbohydrate-containing proteins was found. Low concentrations of a variety of salts cause

precipitation of prothrombin but not of thrombin. In aqueous solutions prothrombin is relatively insoluble in the neighborhood of pH 4.9. In the case of thrombin the point of minimum solubility is near pH 4.3. When compared at their respective points of minimum solubility, thrombin is much more soluble than prothrombin. Thrombin, in saline solution, is permanently inactivated by acid at pH 3.5, and reversibly inactivated in the zone pH 3.5 to 4.1. In the case of prothrombin, inactivation begins at pH 4.8 and is complete at pH 3.5. On addition of alkali, inactivation of both prothrombin and thrombin begins at pH 10 and is quite marked above pH 11. In aqueous solutions prothrombin and thrombin show partial inactivation after being heated for 30 min. at 40° [C]. At 60° inactivation is virtually complete. Nitrous acid destroys the activity of both prothrombin and thrombin.

Bromelin: Properties and commercial production, A. K. BALLS, R. R. THOMPSON, and M. W. KIES. (U. S. D. A.). (*Indus. and Engin. Chem.*, 33 (1941), No. 7, pp. 950-953, figs. 2).—The authors investigated the effect upon bromelin of the factory operations of pineapple canning. The enzyme in the juice is remarkably resistant to heat. A method which laboratory experiments have indicated might be used to recover bromelin from low-grade juice without decreasing the yield of alcohol is suggested. It was found that the activity of a bromelin preparation at a fixed pH depended upon the previous pH at which the preparation was held. The observed facts indicate that the enzyme protein easily undergoes reversible denaturation.

The preparation of 2-(aldo-polyhydroxyalkyl) benzimidazoles, S. MOORE and K. P. LINK. (Wis. Expt. Sta.). (*Jour. Organic Chem.*, 5 (1940), No. 6, pp. 637-644).—Yields in the direct oxidative condensation of aldomonosaccharides with *o*-phenylenediamine have been raised to 25 and 40 percent for the gluco and galacto derivatives. For the preparation from the aldonic acid instead of from the aldose, conditions which give from 70 to 80 percent benzimidazole yields with a series of carbohydrate acids were found. The variation in the condensation of stereoisomeric aldonic acids with *o*-phenylenediamine and the differences in stability of the resulting benzimidazoles were investigated. The methods of preparation and the chemical properties of the 2-aldobenzimidazoles were studied in reference to the use of these derivatives in carbohydrate characterization (E. S. R., 86, p. 435).

Hemicelluloses of cornstalks, H. D. WEINE and M. PHILLIPS. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 7, pp. 401-406).—A hemicellulose fraction was isolated from cornstalks, previously freed of fatty and waxy materials, sugars, and pectic substances, by extracting them exhaustively at room temperature with a 5-percent aqueous sodium hydroxide solution and precipitating with ethanol. The product was delignified by treatment with chlorine and extraction with an ethanolamine solution in ethanol. On hydrolysis with dilute sulfuric acid, the lignin-free hemicellulose fraction afforded *d*-glucuronic acid, *l*-arabinose, and *d*-xylose in the approximate molar ratio of 2:7:19. The cellulosic material remaining after the removal of the first hemicellulose fraction was successively extracted in the cold with 10- and 17-percent aqueous sodium hydroxide solutions, and two additional hemicellulose fractions were obtained. These differed quantitatively from the first hemicellulose fraction, although on hydrolysis they both yielded *d*-xylose and *l*-arabinose.

Fractional distillation of unsaturated fatty acids.—I. The effect of vacuum distillation on the absorption spectra of polyethenol esters from cod liver oil, F. A. NORRIS, I. I. RUSOFF, E. S. MILLER, and G. O. BURR. (Univ. Minn.). (*Jour. Biol. Chem.*, 139 (1941), No. 1, pp. 199-206, fig. 1).—Spectroscopic and chemical evidence indicates that distillates obtained by vacuum fractional

distillation of methyl esters of highly unsaturated fatty acids are sufficiently representative of the original material to be used in isolation and structure work. Analytical applications of the process are limited by the concentration of isomerized material in the residue.

Succinic acid as a metabolite in plant tissues, G. W. PUCHER and H. B. VICKERY. (Conn. [New Haven] Expt. Sta.). (*Plant Physiol.*, 16 (1941), No. 4, pp. 771-783, fig. 1).—Succinic acid was shown to be present in a number of normal plant tissues, although the proportion found was in all cases considerably less than 1 percent of the dry weight. As compared with malic, oxalic, or citric acid, it is a minor constituent. When a study was made of the behavior of succinic acid during the development of the tobacco plant, the extensive changes in quantity and in concentration indicated that it may be regarded as one of the more active metabolites of the tissues.

The position of carbon dioxide carbon in succinic acid synthesized by heterotrophic bacteria, H. G. WOOD, C. H. WERKMAN, A. HEMINGWAY, and A. O. NIER. (Iowa Expt. Sta. coop. Univ. Minn.). (*Jour. Biol. Chem.*, 139 (1941), No. 1, pp. 377-381).—Break-down of succinic acid synthesized by bacteria showed that the fixed carbon dioxide $C^{13}O_2$ is exclusively in the carboxyl groups of the acid. This observation is in agreement with the authors' belief that carbon dioxide is fixed by union with pyruvic acid.

Isolation and properties of a pure yeast polypeptidase, M. J. JOHNSON. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 137 (1941), No. 2, pp. 575-586, figs. 2).—The author isolated a protein having high polypeptidase activity from brewers' yeast. The protein behaved as a homogeneous substance on electrophoresis and ultracentrifugal sedimentation and showed a molecular weight in the neighborhood of 700,000. It was not obtained in a crystalline state. This polypeptidase split tripeptides much more rapidly than dipeptides. It hydrolyzed the peptide linkage adjacent to the free amino group of the peptide and did not require a carboxyl group. The presence of zinc ions and halide ions appeared necessary for its activity.

A convenient micro-Kjeldahl nitrogen method involves digestion of a sample containing from 10 to 40 μ g. of nitrogen with the aid of copper selenite as catalyst and colorimetric determination of the ammonium salts formed without distillation of ammonia by means of a reagent of the Nessler type.

The effects of different buffers on the activity of β -amylase, G. A. BALLOU and J. M. LUCK (*Jour. Biol. Chem.*, 139 (1941), No. 1, pp. 233-240, figs. 5).—The pH optima for β -amylase activity in the presence of formate, acetate, propionate, butyrate, valerate, phenylacetate, succinate, phthalate, citrate, and phosphate were determined. Variation of the buffer anion was without significant influence on the relative activity of β -amylase at the pH optima, except for a slight inhibitory effect of phenylacetate and phthalate. The activity-pH curves approximately coincide on the alkaline side of the pH optima, whereas on the acid side a marked specific buffer influence was manifested. High concentrations of urea were found to inhibit the saccharogenic action of β -amylase on starch.

A rapid and convenient method for the preparation from hard winter wheat of β -amylase in the form of an active, water-soluble powder is described.

Lipides isolated from alfalfa-leaf meal, H. G. PETERING, P. W. MORGAN, and E. J. MILLER. (Mich. Expt. Sta.). (*Indus. and Engin. Chem.*, 33 (1941), No. 11, pp. 1428-1432; *abs. in Michigan Sta. Quart. Bul.*, 24 (1942), No. 3, p. 260).— β -Carotene contained in the concentrate of unsaponifiable constituents of alfalfa leaves is completely utilized as a source of vitamin A in animal experiments, and the concentrate contains sterol which can be activated by ultraviolet light to produce rat antirachitic activity. The authors obtained from 1 ton of alfalfa

leaf meal a concentrate containing about 340,000,000 International Units of vitamin A (as β -carotene) and at least from 12,000,000 to 16,000,000 units of vitamin D. The irradiation of the concentrate for the activation of the sterol appeared not to cause appreciable destruction of the carotene. Several methods for preparing derivatives of chlorophyll as byproducts of the process for the unsaponifiable constituents are suggested.

Isolation of unsaponifiable constituents from green plant tissue: Improvements in processing dehydrated alfalfa-leaf meal, P. W. MORGAL, H. G. PETERING, and E. J. MILLER. (Mich. Expt. Sta.). (*Indus. and Engin. Chem.*, **53** (1941), No. 10, pp. 1298-1302, figs. 6).—Improvements in the method for isolating carotene from dehydrated alfalfa leaf meal by the barium hydroxide process were developed. Larger scale preparations resulted in the isolation of constituents other than carotene (xanthophyll, sterols, and chlorophyll), as well as improvements in the working up of the material. During the barium hydroxide reaction, diatomaceous earth prevented the formation of large hard balls of barium sludge, which are difficult to wash free of valuable constituents. All soluble barium was completely removed from the concentrate by the addition of a small amount of magnesium sulfate during the final concentration. Most of the xanthophyll was removed from the crude concentrate by a treatment with petroleum naphtha, which leaves the xanthophyll as an insoluble residue. The unsaponifiable concentrate obtained contained 60,000 units of vitamin A per gram (as carotene) and appeared to include a natural stabilizer for carotene against air oxidation. The irradiation of this concentrate with ultraviolet light activated the sterol in it to vitamin D. Its freedom from objectionable odor and taste should make it suitable for fortifying foods with vitamins A and D. Crystalline carotene may also be obtained from the concentrates.

Photochemistry of the thiazole component of vitamin B₁, F. M. UBER and F. VERBRUGGE. (Univ. Mo.). (*Jour. Biol. Chem.*, **136** (1940), No. 1, pp. 81-86, figs. 2).—The photochemical decomposition at λ 2,537 a. u. of the "thiazole" component (4-methyl-5- β -hydroxyethylthiazole) of vitamin B₁ was demonstrated by its loss of selective absorption and its inability to support the growth of *Phycomyces* cultures. The quantum yield for inactivation, when inactivation results from changes in side groups as well as from a break-down of the ring structure, was found to be 0.347. The corresponding value previously found for the pyrimidine component was 0.0184.

An injection manometer assembly for the study of reactions at steady state, G. MARSH and L. CARLSON (*Jour. Biol. Chem.*, **136** (1940), No. 1, pp. 69-72, fig. 1).—It was found that the technic of addition of peroxide to the (Warburg) manometer vessel from the side bulb was unsuited to the accurate determination of the relation of respiratory rate to peroxide concentration. Addition from the side bulb produced a reaction whose velocity varied continuously until disappearance of the peroxide, the entire reaction was completed in from 5 to 10 min., and other disadvantages were noted. The authors describe and show in diagrammatic form a modification of the standard apparatus by means of which it is possible to inject 1 cc. of solution into the flask at a constant rate over a period of 1 hr. By controlling the concentration of the material injected and the speed of the kymograph, both the amount delivered and the time of delivery may be varied within wide limits. A steady rate of reaction is reached within a few minutes after the injection is begun. The rate is maintained over an adequate time period, permitting the study of reaction velocities without the complication of rapidly shifting concentrations.

A laboratory-size leaf-type pressure filter, T. F. CLARK, N. PORGES, and S. I. ARONOVSKY. (U. S. D. A. coop. Iowa State Col.). (*Indus. and Engin.*

Chem., Analyt. Ed., 12 (1940), No. 12, pp. 755-757, figs. 4).—Simple construction permits fabrication of this pressure filter in the average laboratory shop. The filter leaves are adaptable to either top or bottom drainage. The filter has an effective filtering surface of 54 sq. in. and a calculated, wet-cake capacity of 0.69 l. Hydraulic pressures up to 30 lb. per square inch (gage) have been used successfully. Fully dimensioned working drawings and photographs of the parts and of the completed assembly show the construction.

For the purpose of repeated recovery of noncontaminated mycella for reuse in mold fermentations, the filter must be easily and positively sterilized, prevent the ingress of contaminating organisms, facilitate the return of mycella to the fermenter, and be constructed of materials which do not inhibit further activity of the fermenting organism. When constructed from commercially pure aluminum alloys and stainless-steel machine screws, the filter met these requirements.

Accurate measurement of X-ray diffraction films, H. P. KLUG. (Univ. Minn.). (*Indus. and Engin. Chem., Analyt. Ed.*, 12 (1940), No. 12, pp. 753-754, fig. 1).—The author notes the high cost of the auxiliary devices used in many of the measuring instruments for determining line position in X-ray powder and rotation photograph films and describes, in constructional detail, an instrument which has proved to be simple to manipulate, sufficiently accurate, satisfactory for both powder and rotation photographs, and economical to construct, since it requires only standard available parts and simple machine work.

A new microphotometer, H. B. VINCENT and R. A. SAWYER (*Jour. Opt. Soc. Amer.*, 31 (1941), No. 10, pp. 639-643, figs. 4).—The design of a spotting microphotometer for rapid routine service is discussed in detail. The optical system chosen is shown in a diagrammatic drawing, and some of the structural details of the instrument made are described.

A simplified microhydrogenation apparatus, I. B. JOHNS and E. J. SEIFERLE (Iowa State Col.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 11, pp. 841-843, fig. 1).—A simple apparatus for quantitative catalytic microhydrogenation is described, and details of the necessary corrections for temperature and barometric pressure changes are given. An accuracy of ± 2 percent, sufficient for determining the number of hydrogenated groupings in organic compounds, is attainable.

A laboratory-scale flow regulator, V. H. CHELDELIN and B. E. CHRISTENSEN. (Oreg. State Col.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 11, p. 805, fig. 1).—A leveling bulb is suspended by a cord wound about a drum on the shaft of an escapement mechanism, the rate of unwinding being controlled by the period of a pendulum attached to the escapement lever. The slow descent of the leveling bulb lowers the pressure in a receiving bottle, causing a flow of gas, the rate of which is dependent upon the diameter of the drum and the period of the pendulum but independent of the increasing weight of the leveling bulb, which increases the amplitude but not the frequency of the swing. The escapement mechanism may be that of a pendulum clock.

A convenient six-tube vapor sorption apparatus, A. J. STAMM and S. A. WOODRUFF. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 11, pp. 836-838, figs. 4).—An improved compact six-tube sorption apparatus for sorption measurements under partial vacuum is described. Adsorption and desorption measurements at 20° C. for unextracted white spruce wood, a commercial bleached sulfite pulp, and a cotton linters α -cellulose are given. The data indicate that the ratio of the adsorption to the desorption moisture con-

tents is constant over a large part of the relative vapor pressure cycle, and that the ratios for the different cellulosic materials are similar.

An adjustable vapor thermoregulator, J. Y. YEE. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 11, p. 839, fig. 1).—The author describes a thermoregulator which, although of the ether vapor type and of high sensitivity (control to $\pm 0.02^\circ$ C.), does not require to be constructed at the point of use and may further be made adjustable over a range of 20° or more.

A method of installing tube-wall thermocouples, E. L. PATTON and R. A. FEAGAN, JR. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 11, pp. 823–824, fig. 1).—The authors describe a method of installation which may be used to locate a thermocouple junction at any point in the wall of the tube and by which the leads may be carried to any desired point through a substantially isothermal zone.

Synthetic corrosion pits and the analysis of their contents, E. D. PARSONS, H. H. CUDD, and H. L. LOCHTE (*Jour. Phys. Chem.*, 45 (1941), No. 9, pp. 1339–1345, figs. 2).—A modified apparatus and technic for a micropotentiometric titration method was used in the analysis of the contents of artificial corrosion pits and is suggested for the study of actual corrosion pits and tubercles.

The Signer method for determining molecular weights, E. P. CLARK. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 11, pp. 820–821, figs. 3).—In principle the method consists in permitting two solutions in an evacuated system, with solvent vapors in contact, to arrive at vapor-pressure equilibrium by isothermal distillation. Arrangements must be available for determining the volumes of each solution. The apparatus used is smaller than the original,¹ to make possible accurate measurements of from 1.5 to 1.7 cc. of liquid. The solutions usually being approximately 0.1 M, the quantity of substance necessary for a determination is small. A procedure more precisely specified than that of the original article is given. It is noted that very accurate results are obtainable.

Colorimetric analysis of a two-component color system, H. W. KNUDSON, V. W. MELOCHE, and C. JUDAY. (Univ. Wis.). (*Indus. and Engin. Chem., Analyt. Ed.*, 12 (1940), No. 12, pp. 715–718, figs. 3).—The authors present a mathematical discussion of two-color systems in which the absorption bands are too close together to permit spectral separation and the resolution of such systems through differential separation of the absorption bands by means of two appropriately selected filters. The details for calculating the concentration of one desired component in unknown mixtures with second component are given.

Experimental evidence in support of these theoretical conclusions is offered in the aluminum-iron-hematoxylin system. A calibration for this system is given, together with a table of experimental results with synthetic samples. Some changes in the concentration of reagents used in the hematoxylin method are recommended. This method is shown to be suitable for determining small quantities of aluminum in natural waters in which only small quantities of iron occur.

Stability of the permanganate-periodate color system, J. P. MEHLIG. (Oreg. State Col.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 11, p. 819).—The author found the permanganate plus periodate solutions of the Willard and Greathouse method (E. S. R., 38, p. 204) to be exceptionally stable, showing no change at all during 2 mo. and relatively small change during an additional 23 mo.

Iodometric estimation of small quantities of nitrogen without distillation, M. LEVY and A. H. PALMER (*Jour. Biol. Chem.*, 136 (1940), No. 1, pp. 57–

¹ Liebig's Ann. Chem., 478 (1930), No. 3, pp. 246–266, figs. 20.

60).—The ammonia is caused to react with a stabilized hypobromite solution prepared fresh each day by mixing 20 cc. of a solution of 2.5 cc. of Br_2 and 20 gm. of KBr in a liter of water with 50 cc. of 0.4 N NaBO_2 prepared from 100 cc. of 4 N NaOH and 24.7 gm. of H_3BO_3 made up to a liter. The reduced alkalinity of this solution as compared with NaOH-Br_2 mixtures slows the change of NaOBr to NaBrO_3 . To estimate the excess NaOBr , approximately 0.5 gm. of solid KI is added and caused to dissolve by shaking. The solution is then acidified by the addition of 1 cc. of 6 N H_2SO_4 and the liberated iodine titrated with standard 0.01 N thiosulfate; 3 drops of 1 percent starch in 20 percent NaCl were used near the end point. The nitrogen in the sample in milligrams is calculated by multiplying the difference between the titer of the unknown and that of a blank by the normality of the thiosulfate and then by $14.01/3=4.67$. The blank usually falls between 12 and 14 cc. Procedures for the ranges from 0.5 to 0.05 mg. and from 0.05 to 0.005 mg. of nitrogen are described.

Titration of ammonia in presence of boric acid in the macro-, semimicro-, and micro-Kjeldahl procedures, using methyl red indicator and the color-matching end point, E. C. WAGNER (*Indus. and Engin. Chem., Analyt. Ed.*, 12 (1940), No. 12, pp. 771-772).—A 4 percent solution of boric acid serves for the macro-, semimicro-, and microprocedures. To insure the presence of the same quantity of methyl red in both color standard and analysis liquid, the methyl red should be added to the whole supply of boric acid solution. There is at no time a sharp color change, but at the equivalence point the intensity of the red color is identical with that of the boric acid-methyl red solution similarly diluted. This point of equal intensities can be recognized by comparing with a properly prepared color standard which contains in the same volume of liquid the same quantities of boric acid and methyl red. Most persons can readily detect the differences in color intensity corresponding to from 0.01 to 0.02 cc. of standard acid. The acid used was 0.1-0.2 N , 0.02 N , and 0.01 N for the macro-, semimicro-, and microscscales, respectively.

Photometric determination of potassium with dipicrylamine, E. AMDUR. (Univ. Minn.). (*Indus. and Engin. Chem., Analyt. Ed.*, 12 (1940), No. 12, pp. 731-734, figs. 3).—The absorption spectra of solutions of potassium dipicrylamine were determined with a visual spectrophotometer. These curves showed that the filter should have a sharp cut-off at about 5,300 $\text{m}\mu$ and allow as little as possible of the red or infrared to come through. The use of a 1-cm. cell and a combination of Corning glasses Nos. 556 and 429 gave good results over a considerable range of concentrations. The author also modified the procedure to reduce the amount of necessary manipulation and to allow working at room temperature.

A microcolorimetric method for the determination of potassium in biological materials, P. W. SALIT (*Jour. Biol. Chem.*, 136 (1940), No. 1, pp. 191-200).—The material is ashed in specially made nickel centrifuge tubes in the presence of HgO at a temperature of $465^\circ [\text{C}]$. The potassium in the soluble ash is determined by a colorimetric chloroplatinate method.

The determination of sodium, W. V. CONSOLAZIO AND D. B. DILL (*Jour. Biol. Chem.*, 137 (1941), No. 2, pp. 587-592).—The method of leaching ash with distilled water appears to leave some sodium undissolved and gives results that may be too low by 4 milliequivalents per liter. With the Butler-Tuthill technic (*E. S. R.*, 67, p. 7) slightly modified, recoveries averaged 99.5 percent from these solutions. No values were too high when phosphate was not removed. Work on plasma revealed a slight loss of sodium when porcelain was used for ashing and a considerable loss when ferric sulfate was added before ashing and water was used for leaching the ash. It is concluded that the latter procedure gives results too low by about 3 or 4 m. e.

The molybdenum blue reaction: A spectrophotometric study, J. T. WOODS and M. G. MELLON. (Purdue Univ.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 11, pp. 760-764, figs. 3).—The transmission curves of the blue complex as affected by the reducing agents of Denigès (E. S. R., 44, p. 611), Fiske and Subbarow (E. S. R., 55, p. 310), and of other users of the reaction for analytical purposes; the application of the reaction in determinations of phosphorus, arsenic, and silicon; and the effects of a number of variables upon the nature and intensity of the color produced were investigated, as were also the interferences and maximum permissible concentrations of numerous cations and anions. The failure of certain proposed permanent standards to match the molybdenum blue transmission curves is also shown.

Separation and determination of lead with salicylaldoxime, W. B. LIGETT and L. P. BEEFELD. (Purdue Univ.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 11, pp. 813-815, fig. 1).—Lead can be determined by precipitation as lead salicylaldoximate, weighing the resulting precipitate after drying at 105° C. and calculating the amount of lead on the basis of the formula $PbC_7H_5O_2N$. From nitrate solutions, precipitation begins just above pH 4.8 and is complete at 6.9, but precipitation must be carried out at pH 8.9 or above in order to obtain a lead salicylaldoximate to which the theoretical factor (0.6053) can be applied. The effect of acetate concentrations as low as 0.05 M is to increase (by about 0.5 pH unit) the pH necessary for the beginning of precipitation, for complete precipitation, and for complete precipitation as lead salicylaldoximate. Lead can be separated as the salicylaldoximate from silver, cadmium, and zinc in strongly ammoniacal solutions. Salicylaldoxime reagent cannot be used in conjunction with high ammonia concentrations to separate lead from copper, nickel, cobalt, bismuth, iron, magnesium, manganese, or mercury.

Decomposition temperatures of some analytical precipitates: Calcium carbonate and lead sulfate, M. L. NICHOLS and B. E. WHITE. (Cornell Univ.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 4, pp. 251-256, figs. 6).—Calcium carbonate showed average dissociation pressures of from 0.15 mm. at 560° C. to 6.60 mm. at 679° under the experimental conditions described. Lead sulfate studied at four temperatures first showed appreciable weight loss at 730°.

Unreliability of the benzidine color reaction as a test for montmorillonite, J. B. PAGE. (Univ. Calif.). (*Soil Sci.*, 51 (1941), No. 2, pp. 133-140).—Since benzidine can be readily converted into a blue-colored semiquinone by the action of oxidizing agents and montmorillonite is neither necessary for nor sufficient in itself to give the color test, and since, with proper oxidizing conditions, other mineral types give the same effect as montmorillonite, it is felt that the benzidine test cannot be considered specific for this mineral. The presence of slightly soluble iron was demonstrated in materials which gave the test, and removal of the more soluble iron compounds caused loss of the power to give the test.

Base exchange capacity determination of soils by means of a rapid colorimetric copper method, D. H. SIELING. (Purdue Univ.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 1, pp. 24-36, fig. 1).—The exchange capacity is found by measuring the decrease in copper concentration produced in a measured volume of a cupric acetate-acetic acid reagent by a weighed quantity of soil. The acidity of the reagent is adjusted to 0.07 N with respect to acetic acid and to 0.2 N in cupric ions for best results. The soil is shaken with the reagent to insure a practically complete reaction, and the resulting suspension is filtered. The quantity of copper remaining in a measured volume of the filtrate is determined colorimetrically by treating the filtrate with dilute ammonium hydroxide

to produce the stable, highly colored cuprammonium complex ion and then comparing the intensity of the color produced with standards containing known quantities of copper.

The values obtained by this method with 21 soils correlated reasonably well with those obtained by two different leaching methods and required much less time. Visual comparison of the unknown solutions with the standards was made in a simple and convenient combination filter rack and color comparator.

Soil and plant material analyses by rapid chemical methods, III, F. E. HANCE (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.]*, 45 (1941), No. 4, pp. 265-296, pl. 1, figs. 5; also *Hawaii, Sugar Planters' Sta., Agr. and Chem. Bul.* 53 (1941), pp. 265-296, pl. 1, figs. 5).—The author presents a clarification of directions, etc., concerning which some confusion has arisen in the use of the earlier published methods (E. S. R., 77, p. 743), and adds modifications of some of the methods already in use, together with new methods for rapid estimates of total soil phosphate content and of sulfates in cane juices.

Organic phosphorus in soils.—I, The extraction and separation of organic phosphorus compounds from soil, W. J. DYER and C. L. WRENSHALL (*Soil Sci.*, 51 (1941), No. 2, pp. 159-170).—The efficiencies of various procedures for the extraction of organic phosphorus were investigated. Hot 5-percent ammonium hydroxide, preceded by leaching with $N HCl$, gave almost complete extraction. The completeness of extraction obtained with hot ammonia showed that the extent of the destruction of organic phosphorus compounds is small, the organic phosphorus compounds present being very stable. The product is probably a mixture of nucleotide substances and phytin.

In the majority of the soils examined only about 10 percent of the organic phosphorus passed into the filtrate from the α -humus. The presence of oxalate ion caused the organic phosphorus of the filtrate to be increased to as much as 52 percent. By the use of these modifications, yields of from 35 to 46 percent of the total soil organic phosphorus were obtained as the "nucleotide" fraction, compared with former yields of from 5 to 13 percent. The α -humus still contained about 40 percent of the organic phosphorus. Evidence for the presence in soil of phytin as well as nucleotide substances was found in the behavior of the organic phosphorus of soil toward the extraction and separation treatments.

Determination of boron in some soils of Illinois and Georgia, E. E. DETURK and L. C. OLSON. (Ill. Expt. Sta. coop. Ga. Expt. Sta.). (*Soil Sci.*, 52 (1941), No. 5, pp. 351-357, fig. 1).—The authors describe a fusion method for total boron content of soils and a water-extraction method, both being modifications in details of the basic procedure for colorimetric boron determinations by means of quinalizarin, described by the same authors (E. S. R., 85, p. 298).

Effect of temperature of alcohol in determination of potash in fertilizers, C. W. HUGHES and O. W. FORD. (Ind. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 4, pp. 233-234).—A rise of about 8° C. was noted upon addition of concentrated hydrochloric acid to alcohol at the rate of 0.6 cc. of hydrochloric acid to 6 cc. of alcohol, and the temperature remained above room temperature for the 15-min. extraction period. It was found advisable to mix the acid and alcohol and cool before adding it to the potassium chloroplatinate. When the determination was carried out at high summer temperatures, results from 0.1 to 0.3 percent higher were obtained by cooling the alcohol to about 18°.

Organic acids in plant tissues: Modifications of analytical methods, G. W. PUCHER, A. J. WAKEMAN, and H. B. VICKERY. (Conn. [New Haven])

Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 4, pp. 244-246).—Modifications of previous methods for determining the total organic acidity and the malic, citric, and oxalic acid content of dried plant tissues permit complete analyses to be made on 0.5 gm. or even on 0.1 gm. of material, without sacrifice of accuracy and with greater convenience. In addition to the reduction of scale, the new methods involved an important simplification of the ether-extraction technic which eliminates the use of paper extraction thimbles.

The rate of inversion of sucrose as a function of the dielectric constant of the solvent, C. J. PLANK and H. HUNT. (Purdue Univ.). (*Jour. Phys. Chem.*, 45 (1941), No. 9, pp. 1403-1415, figs. 2).—The rate of inversion of sucrose was determined in solvent mixtures containing varying percentages of dioxane and water, the solutions being 0.02, 0.05, and 0.10 N with respect to hydrochloric acid. The unimolecular constant, k , was shown to increase as the percentage of dioxane was raised. This change was closely approximated by the general equation $\log (k/k_0) = 11.6 \left(\frac{1}{D} - \frac{1}{D_0} \right)$. The effect was the same for all

three concentrations of the catalyst. The change in k with the concentration of hydrochloric acid was found to be greater than that expected if the reaction rate was proportional to the concentration of hydrochloric acid, the speed of the reaction increasing in ratio greater than that of the hydrochloric acid concentrations. The specific rotation of the invert sugar was found to decrease very sharply in proportion to the weight percentage of dioxane in the solvent.

Rapid determination of reducing sugars: Extension of Forsee's photocolorimetric ferricyanide method, S. A. MORELL. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 4, pp. 249-251, fig. 1).—This is an extension of the concentration range of the method founded by Forsee (E. S. R., 81, p. 329) upon that devised by Hassid (E. S. R., 79, p. 9).

Redetermination of the Munson-Walker reducing-sugar values, L. D. HAMMOND (*Jour. Res. Natl. Bur. Standards [U. S.]*, 24 (1940), No. 5, pp. 579-596, fig. 1).—Sugars of a purity higher than that of those available in 1906 being now obtainable, the author redetermined the values given in the tables named, adding values for levulose and for mixtures consisting of 0.3 gm. of total sugars containing so high a percentage of invert sugar that neither column of sugar-mixture values in the original table was directly applicable. The copper was determined electrolytically, and the solution was heated by electricity. The substitution of electricity for gas flame heating produced no change in the results. For a given weight of copper the new values are somewhat higher than the old. An extensive table showing the reducing-sugar values for weights of copper from 10 to 435 mg. in 1-mg. intervals is presented.

Errors of Munson and Walker's reducing-sugar tables and the precision of their method, R. F. JACKSON and E. J. McDONALD (*Jour. Assoc. Off. Agr. Chem.*, 24 (1941), No. 3, pp. 767-788).—From a detailed examination of this empirical method it was found that considerable errors are introduced by weighing the precipitate copper oxide as such rather than determining its copper content by other means, since the cuprous oxide is contaminated with organic decomposition products even when pure sugars are analyzed. Errors in the tables were also found, and Hammond's revised tables (above noted) should be substituted. A modification of the Shaffer-Hartmann (E. S. R., 45, p. 111) iodometric method for determining the copper gave good results, as did also a dichromate and a permanganate method.

Quantitative determination of alpha and beta lactose in dried milk and dried whey, P. F. SHARP and H. DOOB, JR. (Cornell Univ.). (*Jour. Dairy*

Sci., 24 (1941), No. 7, pp. 589-602).—A clear, colorless extract of the product is obtained quickly by using an alcoholic solution of HgCl_2 as protein precipitant and norrit as a decolorizing agent. The rotation of the filtrate is determined as soon as possible and again after standing. The relative amounts of α - and β -lactose are computed from the change in optical rotation. Total lactose is calculated from the final (equilibrium) rotation and sample weight. α - and β -lactose gave satisfactory results when analyzed by this method, as did also dried milk and whey, alone and with additions of α - and β -lactose. The composition of the lactose in dried whey was shown to range from 90 percent β to 95 percent α , on the anhydrous basis. Norrit adsorbs lactose from aqueous solution, the α form being adsorbed preferentially. Lactose is eluted from the norrit by from 10 to 20 percent alcohol.

Determination of starch by the A. O. A. C. malt-diastase method: Effect of pretreatment of samples, R. T. BALCH and J. K. PHILLIPS. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 11, pp. 815-818).—Data from determinations of starch in sweetpotatoes indicate that a considerable error in starch value arises with the malt-diastase method when the usual procedure is followed. Pretreatment with calcium or barium hydroxide solution largely prevents the action of malt diastase on certain nonstarchy constituents usually determined as starch, and for the most accurate determination of starch in sweetpotatoes such pretreatment is essential.

The action of light on cellulose.—VI, A method for the measurement of the osmotic pressure of colloidal solutions, R. E. MONTONNA and L. T. JILK. (Univ. Minn.). (*Jour. Phys. Chem.*, 45 (1941), No. 9, pp. 1374-1381, figs. 4).—An osmotic pressure cell, the preparation of satisfactory membranes, and the technic of the osmotic pressure measurement itself are detailed.

Determination of glycerol by oxidation with ceric sulfate in fermentation media containing dextrose, E. I. FULMER, R. J. HICKEY, and L. A. UNDERKOFER. (Iowa State Col.). (*Indus. and Engin. Chem., Analyt. Ed.*, 12 (1940), No. 12, pp. 729-730).—The procedure involves the determination of the sugar by a copper titration method, followed by the oxidation of another sample with ceric sulfate under standardized conditions. Both the sugar and the glycerol are oxidized, but, from a correction for the ceric sulfate used by the sugar, the glycerol is calculated by means of suitable equations or read from a graph.

Ultraviolet absorption spectra of linseed oil: Determination of bodied-in-vacuo and blown linseed oil in mixtures with raw linseed oil, J. H. MITCHELL, JR., and H. R. KRAYBILL. (Ind. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 11, pp. 765-768, figs. 3).—An examination of the ultraviolet absorption spectra of a series of linseed oils bodied by blowing at 220° F. and by heating in vacuo at 535° showed that the absorption spectrum of a mixture of either type of oil with raw linseed oil may be used for the determination of the bodied constituent. Both types have maxima at 2,320 a. u., but the presence of a band with a maximum near 2,700 a. u. in the oxidized series distinguishes these oils from the oils bodied in vacuo. In the bodied-in-vacuo series the band at 2,320 a. u. has been attributed to the formation of conjugated octadecadienates as a step in the polymerization process.

Determination of gossypol in crude cottonseed oil, H. D. ROYCE, J. R. HARRISON, and P. D. DEANS (*Indus. and Engin. Chem., Analyt. Ed.*, 12 (1940), No. 12, pp. 741-744, fig. 1).—A modification of the pyridine-aniline method, which recovers up to 98 percent of gossypol from a 0.2 percent solution in oil, is described. The pyridine-aniline reagent precipitates dianillogossypol containing 2 molecules of pyridine of crystallization. The pyridine is removed quantitatively, without decomposition of the residual dianillogossypol, by heating the

precipitate 1 hr. at 160° C. The dianilinogossypol-dipyridine complex is fairly stable at 60°, and, after heating for 2 hr. at this temperature, its composition corresponds closely to the formula $C_{22}H_{12}N_2O_5 \cdot 2C_5H_5N$. The addition of a small amount of pyridine to the petroleum ether used for washing the dianilinogossypol precipitate decreases the solubility of the precipitate and gives higher recovery of gossypol from dilute oil solutions.

Pyridine alone will not precipitate gossypol from crude cottonseed oil. The solubility of gossypol in pyridine was found to be 13.3 percent by weight at 25°. A pyridine-gossypol complex having the formula $2C_{20}H_{10}O_5 \cdot 5C_5H_5N$ is described.

A simple, accurate method of estimating carbon monoxide in blood, F. J. W. ROUGHTON (*Jour. Biol. Chem.*, 137 (1941), No. 2, pp. 617-625).—The principle of the method is to bind the O_2 and CO_2 by mixing the blood solutions with an alkaline glycinate-hyposulfite mixture, and at the same time to evolve the N_2 into the gas phase. The only gas remaining in solution is then CO , which is subsequently liberated by shaking with neutral ferricyanide solution.

A micromethod for the determination of carbon dioxide in blood and other fluids, R. S. WEST, B. E. CHRISTENSEN, and R. E. RINEHART. (Oreg. State Col. et al.). (*Jour. Biol. Chem.*, 132 (1940), No. 2, pp. 681-686, figs. 2).—The authors describe a procedure having the advantages of requiring relatively simple apparatus and little manipulative skill and yielding results comparable to those obtained by the manometric method. The set-up consists essentially of a reaction vessel of 10-cc. capacity, to which is sealed a vessel to contain the required 4 cc. of 5 percent sulfuric acid and to permit, through a two-way stopcock, the admission of carbon dioxide-free air; together with a U-tube connecting, through a second two-way cock, with the absorption vessel, which is a 250-cc. Erlenmeyer flask with a standard ground joint. The absorption flask is partially evacuated before the acid is admitted to start the reaction.

A simple apparatus and procedure for determination of amino acids by the ninhydrin reaction, B. E. CHRISTENSEN, E. S. WEST, and K. P. DIMICK. (Oreg. State Col. et al.). (*Jour. Biol. Chem.*, 137 (1941), No. 2, pp. 735-738).—The authors measure the carbon dioxide given off in the reaction of from 1 to 4 mg. of the amino acid with ninhydrin by aerating the gas under somewhat reduced pressure into standard barium hydroxide solution in a simplified evolution-absorption assembly described in the paper above noted. The time required for a complete determination is 20 min. Agreement with Kjeldahl determinations of amino acids was within 1 percent.

Detection of carbon dioxide and sulfur dioxide from mixtures of carbonates and sulfites, G. B. HEISIG and A. LEBNER. (Univ. Minn.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 11, p. 843, fig. 1).—If a gas containing small quantities of sulfur dioxide and carbon dioxide is passed through a few drops of an acidic solution of ferric ferricyanide, the sulfur dioxide will be oxidized to the nonvolatile bisulfate ion, the brown ferric ferricyanide will be reduced to Turnbull's blue, and the carbon dioxide will pass through the liquid and can be detected with barium hydroxide solution without interference.

A rapid procedure for determination of carbonate, A. C. KUYPER and L. M. JONES. (Ohio State Univ.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 11, pp. 801-802).—The total carbon dioxide is quantitatively precipitated as strontium carbonate, and the solution is adjusted to neutrality to phenolphthalein. A known amount of acid is added to liberate the carbon dioxide, which is then aerated from the solution, and the excess acid is titrated with alkali. If organic acids or bases are present they are either wholly or partially neutralized in the preliminary pH adjustment; after the addition of acid they are brought back to this same state of neutralization. Phosphate is precipitated as strontium

phosphate, and, after the addition of acid, reprecipitated in the back-titration. Iron is precipitated as its oxide and is titrated back to this form. When present in small amounts, ammonia does not interfere; in large amounts it interferes with the phenolphthalein end point. Magnesium is precipitated as the hydroxide when the solution is first made alkaline, and it dissolves slowly when the solution is neutralized. It interferes insofar as it is not dissolved during this neutralization.

Determination of dietary fluorine, J. F. McCLENDON and W. C. FOSTER (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 4, pp. 280-283; figs. 4).—The method, described in detail as to apparatus, reagents, and procedure, involves combustion of the sample in a closed system in which any fluorine volatilized is caught in an absorber charged with 0.2 gm. of sodium hydroxide and 10 cc. of fluorine-free water. The contents of the absorber, the ash, and the washings of the platinum tube with 3 cc. of 0.1 N perchloric acid are transferred to the microstill with 0.1 gm. of powdered quartz and enough silver sulfate or perchlorate to precipitate all the chloride. The improved still permits separation of fluosilicic acid in a single distillation. The perchloric acid carried over may be 0.00015 N and does not interfere with the titration. The distillates of the unknown and the blank are adjusted to pH 3, and each is mixed with 0.1 cc. of 0.04 percent aqueous sodium alizarin sulfonate and matched for color. Thorium solution corresponding to 1 μ g. of fluorine is run into the blank and then into the unknown until it matches the blank. After thorough mixing and full development of color (20 sec.), the blank is back-titrated to the unknown.

"At pH greater than 3.5 there may be error due to free alizarin in red form. At pH less than 3.5 the thorium lake does not show its full color, therefore the thorium must be standardized with fluoride at exactly the same pH at which the titration is made. The back-titration on a blank distillate after adjusting pH with the glass electrode allows this to be accomplished, as well as correcting for fluorine reagents. From 2.5 to 10 μ g. of fluorine added to the sample may be recovered with an error of 5 percent. . . . The method is considered valuable in determining 1 μ g. of fluorine in foodstuffs (error, 7 percent)."

Iodine in thyroid: Elimination of uncertain end point and blank in the U. S. P. XI assay, R. S. BURNETT and R. F. WARKOW (*Indus. and Engin. Chem., Analyt. Ed.*, 12 (1940), No. 12, pp. 734-735).—The uncertain end point and the blank are eliminated and accurate results obtained when the pH is adjusted to about 2.5 to 2.7 and the temperature to about 33° C. before titration. Preliminary investigations of the use of this modified method for determining iodine in mineral feeds has indicated possibilities for use in other fields.

A test for the protein stability of milk, A. B. STORRS (*Jour. Dairy Sci.*, 25 (1942), No. 1, pp. 19-24).—A simple test which consists of mixing increasing amounts of N/10 hydrochloric acid with portions of milk, boiling the mixtures for a specified length of time, and examining the samples for coagulation. According to the schedule of values proposed, untreated fresh milk has an average value of about 60 to 70. Pasteurization tended to increase the stability of milk, whereas copper contamination tended to lower the protein stability.

Specifications of some of the ingredients commonly used in fungicidal dust mixtures, J. D. WILSON and F. IRONS. (Coop. U. S. D. A.). (*Ohio Sta. Bimo. Bul.* 214 (1942), pp. 26-41, figs. 5).—This article describes in working detail standardized methods for determining (for the purpose of securing uniformity in tests of dust mixtures and duster performance) the weight per cubic foot, the weight per cubic inch, particle size, rate of flow, and reaction of

various dust ingredients to insure that the specifications of all materials shall be comparable. An apparatus designed for the determination of weight per cubic foot consisted essentially of a 20-mesh screen and a funnel of square cross section suitably supported over a 1-cu. ft. measure. Volume weight in grams per cubic inch was also determined, a commercially available apparatus being used. Wet and dry season screen tests on 325-mesh screens were made, and average particle size was estimated. Of the last-named measurement, it is noted, however, that "the values obtained after numerous trials are given . . . , but the accuracy of the measurements is not high." Photomicrographs show some of the difficulties inherent in attempts at accurate particle size estimation. Rates of flow through two commercial dusters (a hand-operated and a power-driven machine) were recorded. The reaction (pH value) is also included among the observations tabulated.

Effect of soft glass on melting point of rotenone, H. A. JONES. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 11, p. 819).—Pure rotenone melted about 3° lower in ordinary soft glass than in Pyrex and about 5° lower in a more alkaline soft glass (Corning electrode glass No. 015) than in ordinary soft glass. It is the author's opinion that other sources of error are also present in this method, and that purity of rotenone may be more accurately determined by other means.

Determination of biochemical oxygen demand and dissolved oxygen of river mud suspensions, C. C. RUCHHOFF and W. A. MOORE (*Indus. and Engin. Chem., Analyt. Ed.*, 12 (1940), No. 12, pp. 711-714).—The present study of mud suspensions shows that the so-called immediate oxygen demand is not a true measure of the chemical demand but is largely an apparent oxygen loss due to the failure of the analytical methods employed. Improved analytical procedures which give a better approximation of the true dissolved oxygen content under the adverse conditions met in the examination of mud suspensions are proposed. The time required under aerobic conditions to eliminate the interfering substances was investigated, and the effect on the biochemical oxygen demand of keeping the solids in suspension throughout the incubation period was studied. The following steps in the determination of the true biochemical oxygen demand in river-mud suspensions are recommended: (1) Calculation of the initial dissolved oxygen, (2) maintenance of the solids in suspension during the incubation period, and (3) determination of the dissolved oxygen upon the rotated incubated sample after clarification by alum flocculation.

Preparation of a solution of o-phthalaldehyde for use as a glycine reagent, W. M. SANDSTROM and H. A. LILLEVIK. (Minn. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 11, p. 781).—The reagent named is not on the market, and the o-xylal bromide from which it has customarily been prepared has now become unavailable. The authors, therefore, developed a preparation method involving the oxidation of o-xylene with chromium trioxide in a mixture of acetic anhydride, acetic acid, and sulfuric acid. The product, which could be isolated only in the form of unstable, oily crystals, was kept in the form of a steam distillate solution.

The use of sodium azide for the isolation of streptococci, H. C. LICHSTEIN (*Jour. Bact.*, 42 (1941), No. 2, pp. 293-294).—Concentrations of 0.01, 0.02, and 0.03 percent sodium azide (NaN_3) in infusion and blood agar media exerted a marked inhibitory effect on the growth of 30 strains of gram-negative bacilli and cocci. The growth of 37 strains of gram-positive cocci and bacilli was influenced only slightly by these concentrations of sodium azide. The only exception was *Bacillus subtilis*, the growth of which was markedly inhibited by 0.01 percent.

Growth factors of *Streptococcus thermophilus*, E. G. PRAY. (Purdue Univ.). (*Jour. Bact.*, 42 (1941), No. 2, pp. 291).—*S. thermophilus* could not utilize simple nitrogen compounds. Biotin was found to be essential for the rapid growth of the organism. Proline, hydroxyproline, tyrosine, cystine, tryptophan, glutamic acid, and threonine are all probably essential amino acids for the growth of this micro-organism.

A study of some factors affecting the yield and market value of peppermint oil, N. K. ELLIS, K. I. FAWCETT, F. C. GAYLORD, and L. H. BALDINGER (*Indiana Sta. Bul.* 461 (1941), pp. [2]+27, figs. 10).—The chemical and physical constants of peppermint oil (percentage of esters calculated as menthyl acetate, total menthol, optical rotation, and refractive index) were affected by fertilizer applications only as the degree of maturity of the plants was affected, but the yield was directly affected. The experimental results tabulated were obtained with 300- and 600-lb. applications of the mixtures 0-0-24, 0-8-24, 0-16-24, 0-24-24, and 4-8-24. It is stated that fertilizers containing either 1 part of phosphate to 2 parts of potassium oxide ("potash") or a 1:1 ratio were most effective, 300 lb. giving as good results as did 600 lb. to the acre. Of weeds yielding oils capable of contaminating peppermint oil, only common ragweed was found. The ragweed oil was light yellow in color and offensive in odor and taste. Chewing gum containing 1 percent of ragweed oil in the flavoring was disagreeable to the taste and was unsalable. Rusted condensers made from galvanized sheet metal collected resinous material during distillation and discolored the oil. Aluminum coils, though not now obtainable, would be more satisfactory. To avoid discoloration and deterioration in quality, peppermint oil should be stored in a cool place in a clean, dry, airtight container, the size of which is to be determined by the amount of oil to be stored. It should be free of moisture when stored. Redistillation of discolored peppermint oils is practical, and a small redistilling outfit can be operated in connection with the commercial peppermint still. The experiments indicate the possibility of establishing more definite measures of quality for natural peppermint oil, which would be advantageous to both producers and buyers.

Use of salt in distilling bay leaves, I. N. G. ARRILLAGA and M. JONES. (P. R. Expt. Sta.). (*Amer. Perfumer and Essential Oil Rev.*, 43 (1941), No. 6, pp. 29-32, 79, figs. 6).—Adding common salt to the still water improved yield and quality. Of various other salts tested, potassium nitrate gave the highest yield. Increased distillation temperature, a salting-out effect on some partially water-soluble constituents, osmotic effects and plasmolysis, and effects of the added salt on the emulsion formed by bay oil with the still water are all suggested as possible causes of the improvement noted.

Three years' operation of an experimental sugar bush, C. J. TRESSLER and W. I. ZIMMERMAN (*New York State Sta. Bul.* 699 (1942), pp. 24, figs. 9).—The primary objective in the experimental period covered was to ascertain all sources of lead contamination in maple sirup, to determine the quantity of lead taken up from each source, and to prevent or remove contamination. Some bacteriological and other experimental work was also carried out. The following are among the practices recommended to provide against lead contamination: (1) Start the sirup season with clean equipment and keep all gathering equipment as clean as possible throughout the season; (2) keep buckets covered; (3) gather sap as frequently as possible and reduce to sirup promptly; (4) paint lead-containing gathering equipment with a suitable lead-free paint, making sure that all lead-containing paints have previously been removed; (5) do not clean evaporators containing lead to a bright finish using strong acids or bases; (6) if any repairs are made on metal equipment, use tin solder; (7) if the sirup is

suspected of containing excessive amounts of lead, it should be delead either by filtering or by coagulating milk in the hot sirup and then filtering; and (8) always filter the hot finished sirup through a thoroughly cleaned and odorless felt filter.

Formic acid formation in alcoholic fermentation, L. A. HOHL and M. A. JOSLYN. (Univ. Calif.). (*Plant Physiol.*, 16 (1941), No. 4, pp. 755-769, fig. 1).—A very slight accumulation of formic acid occurred in the early stages of the fermentation of grape juice, but this was followed by an apparent utilization of the acid. In the fermentation of an artificial medium containing yeast juice the utilization of formic acid was greater at all stages of the fermentation than was the formation. A variety of carbon sources and nitrogen sources had little effect upon formic acid formation by these organisms. All the fermented media except red grape juice contained negligible quantities of it. No utilization of formate occurred in the absence of sugar, but about 20 percent of the available formate was utilized in the presence of sugar. Negligible quantities of formic acid were formed under degrees of aeration varying from continuous aeration to fermentation under mercury bungs. The pH apparently influences formic acid formation. A small amount was formed in a medium having an initial pH of 2.5, none at higher pH values. Lactic acid in the samples analyzed was found to interfere with the determination of formic acid by the Dyer fractional steam distillation procedures (E. S. R., 37, p. 13).

Role of acetaldehyde in red wines, M. A. JOSLYN and C. L. COMAR. (Univ. Calif.). (*Indus. and Engin. Chem.*, 33 (1941), No. 7, pp. 919-928, figs. 5).—The changes in aldehyde content in two red dry wines were studied under various conditions to determine the effect of oxidizing and reducing conditions on the accumulation and disappearance of acetaldehyde and with the object of correlating changes in aldehyde content with changes in tannin content and in color of the wine.

[Abstracts of papers presented before the twenty-seventh annual convention of the Technical Association of the Pulp and Paper Industry, New York, N. Y., February 16-20, 1942] (*Paper Mill News*, 65 (1942), No. 8, p. 140).—Abstracts of the following are of bacteriological interest: Effect of Mill Operations on the Number of Bacteria Found in Paper Products, by J. R. Sanborn; and The Lethal Effect of Drier Rolls Upon Bacteria, by J. W. Appling and B. F. Shema.

AGRICULTURAL METEOROLOGY

Weather forecasts: A comparison of methods, V. R. ALLDIS (*Austral. Quart.*, 13 (1941), No. 1, pp. 57-64).—The "orthodox system" in use in British weather bureaus and the Inigo Jones method are considered.

The value of a reliable hurricane station, J. C. MILLAS (*Amer. Met. Soc. Bul.*, 22 (1941), No. 8, pp. 321-326).

The spectral range of ultraviolet solar radiation useful in bioclimatology, W. W. COBLENTZ (*Amer. Met. Soc. Bul.*, 22 (1941), No. 8, pp. 316-318, fig. 1).—"In order to secure uniformity in measuring the spectral range of biologically effective ultraviolet solar and sky radiation, the object of this communication is to summarize what is known regarding the ultraviolet spectral response of several biological reactions involving the health and comfort of mankind—hence, of interest in climatology."

Note on illumination climate and radiation intensity, A. BRESE and N. E. BRADBURY (*Amer. Met. Soc. Bul.*, 22 (1941), No. 8, pp. 319-320, fig. 1).—This is a brief discussion on the importance of a knowledge of the diurnal and seasonal

variation in the illumination due to direct and diffuse solar radiation, which is steadily becoming more evident, and especially with respect to the region of the spectrum corresponding to the visual sensitivity of the human eye.

A climatic map of Jamaica on the Köppen system, J. F. GUERNSEY (*Amer. Met. Soc. Bul.*, 22 (1941), No. 8, pp. 327-331, figs. 4).

Meteorological observations (Maine Sta. Bul. 405 (1941), pp. 530-534).—General summaries are tabulated for 1940 and for January-June 1941 at Orono and Presque Isle.

Servicio Meteorológico Nacional: Condiciones térmicas y pluviométricas de la República Dominicana [The National Meteorological Service: Precipitation and temperature conditions in the Dominican Republic] ([*Dominican Repub.*], *Sec. Estado Agr., Indus. y Trab. Mem.*, 1939, pp. 203-250, figs. 24).

Interrelations among meteorological environment, soil condition, growth response, and yield of crops, G. W. SNEDECOR, I. J. JOHNSON, W. H. PIERCE, M. B. RUSSELL, J. M. AIKMAN, and W. E. LOOMIS (*Iowa Sta. Rpt. 1941, pt. 1, p. 237*).—A progress report on studies of corn.

A year's record of rainfall run-off and soil erosion at Michigan State College, W. U. GARSTKA and C. E. MILLAR (Coop. U. S. D. A.). (*Michigan Sta. Quart. Bul.*, 24 (1942), No. 3, pp. 199-205, figs. 6).—The manner in which the water moves off over the soil surface of a gently sloping Hillsdale loam and, particularly, the effect of snow and of a frozen condition of the soil on the movement are included in this study. It was begun in the summer of 1940, and a progress report is given.

The effects of amount and distribution of rainfall on the protein content of western Canadian wheat, A. E. PAULL and J. A. ANDERSON (*Canad. Jour. Res.*, 20 (1942), No. 4, Sect. C, pp. 212-227, figs. 2).—"Data for 14 yr. were used to determine the average effect of rainfall on the protein content of wheat grown at seven stations in the dry belt of southwestern Saskatchewan. Employing the concept of a regression integral, and working with the rainfall for consecutive 5-day intervals from April 1 to August 3, a curve was obtained which represents the change occurring during the growing season in the average regression coefficient (i. e., the average unit decrease in protein content per unit increase in rainfall). It was found that 34 percent of the residual variance for protein content can be ascribed to variations in rainfall. Above average rainfall during the growing season generally tends to reduce protein content, but this tendency is much more marked during April and early May and during the latter part of July. These are also the periods during which average rainfall is lowest. The effect on protein content of precipitation occurring during the previous fall is of minor importance."

The influence of the rainfall distribution on the cotton yields at the government experimental farms at Akola and Jalgaon, R. J. KALAMKAR and V. SATAKOPAN (*Indian Jour. Agr. Sci.*, 10 (1940), No. 6, pp. 960-974, figs. 3).

Climatic conditions within and adjacent to a forest plantation in the Nebraska sandhills, C. H. NIEDERHOF and R. STAHELIN (U. S. D. A.). (*Jour. Forestry*, 40 (1942), No. 3, pp. 244-248, figs. 2).—Climatological data accumulated over 9 yr. in a 36-year-old jack pine plantation and an adjacent open area in the Nebraska sandhills indicated that the average wind movement within the plantation had been only 28 percent that in the open and continuously decreased with the development of the stand. The average yearly evaporation rate within the plantation was only 58 percent that in the open. In summer, during the hottest part of the day, the plantation had no cooling effect on the atmosphere, but throughout the rest of the year the mean daily, mean minimum, and mean maximum temperatures were lower in the plantation

than in the open. The diurnal temperature range during spring and summer quarters was greater in the plantation, but during fall and winter quarters it was greater in the open. Soil temperatures in the plantation at both 1- and 4-ft. depths were warmer in winter and cooler in spring, summer, and fall than in the open. Due to crown interception the rainfall within the stand was 26 percent lower than in the open. As the crowns developed the rate of rainfall interception apparently increased slightly.

SOILS—FERTILIZERS

[Soil investigations by the Iowa Station] (*Iowa Sta. Rpt. 1941, pts. 1, pp. 80-94, 238; 2, pp. 17-22, figs. 2*).—In part 1, work on the value of commercial cultures for the inoculation of legumes and legume-inoculation problems, decomposition of some humus-forming materials in soils, and microbiological aspects of the decomposition of plant materials is noted by A. G. Norman; the testing of soils and lime, by B. J. Firkins; the relation of capillary conductivity to the capillary tension and moisture content of soil, and investigations of the factors determining the flow and distribution of water in soil and the development of field apparatus for soil moisture measurement, both by M. B. Russell; effect of various natural organic materials at different stages of decomposition on those physical and chemical properties of soils which affect erosion, by Russell, J. B. Peterson, R. W. Pearson, and Norman; microscopic studies on soil erosion, by Peterson; microbial thermogenesis, and microbiological status of some Iowa soils as affected by water logging and erosion, both by Norman and Russell; forms of phosphorus in soils and their availability to plants, by Pearson and W. H. Pierre; potassium availability in different soil types and crop response to potassium fertilization, by Pierre, Pearson, and G. Stanford; morphological and chemical characteristics of Iowa soil types, by R. W. Simonson and Stanford; greenhouse investigations of nutrient deficiencies of soils, by A. J. Englehorn, Pearson, and Stanford; planning of experimental fields for agronomic studies, by R. Meldrum, Pierre, Englehorn, H. Allaway, Stanford, and H. D. Hughes; composition of plants as influenced by soil conditions, soil type, and manural treatments, by Englehorn, Pearson, Pierre, and Stanford; estimation of the productive capacities of soil types, as influenced by slope, degree of erosion, and type of management, by Simonson, Englehorn, and W. G. Murray; and experiments on the use of tensiometers for observing soil moisture conditions under corn, by G. W. Snedecor, I. J. Johnson, Pierre, Russell, J. M. Aikman, and W. E. Loomis.

Part 2 includes studies on soil erosion on the Marshall silt loam in Page County, Iowa, by Pierre, Russell, G. B. MacDonald, and J. B. Davidson; crop responses to lime, manure, and fertilizers on different soil types, by Meldrum, Englehorn, and Allaway; and comparative value of different phosphate fertilizers, by Meldrum, Englehorn, Pierre, and Allaway.

[Soil investigations by the Maine Station] (*Maine Sta. Bul. 405 (1941), pp. 444, 456-458, 465-469*).—Soil researches are briefly noted as follows: An aggridant soil, by W. F. Dove; the pH and available calcium relationships within fields producing both scabby and clean potatoes, by V. C. Beverly and B. Jordan; and the available calcium and pH relationships in Aroostook County potato soils. The term "aggridant," used herein, is a coinage designed primarily for application to foods and to "express a measure both of individual (1d) and group (aggregate) needs."

[Soil investigations by the Puerto Rico University Station] (*Puerto Rico Univ. Sta. Rpt. 1941, pp. 13, 14, 42-43*).—Pot fertility studies supplemented

by field experimentation are reported upon by R. Rodríguez Torrent and J. A. Bonnet; nutrient requirements of the principal economic crops of Puerto Rico and rapid chemical tests for soils, both by Bonnet and A. Rivera Brenes; and relative erosiveness of soils in Puerto Rico, by Bonnet, Rivera Brenes, and Rodríguez Torrent.

Soil mechanics nomenclature, W. P. KIMBALL ET AL. (*Amer. Soc. Civ. Engin., Manuals Engin. Pract. No. 22 (1941), pp. [2]+15*).—This report contains a table giving a list of symbols used in soil mechanics literature, as well as several tables giving definitions of terms used in soil mechanics.

Physical Land Surveys 23 and 24 (*U. S. Dept. Agr., Soil Conserv. Serv., Phys. Land Survey Nos. 23 (1941), pp. [2]+53, figs. 13, maps 2; 24 (1941), pp. [1]+40, figs. 13, maps 2*).—This is a continuation of the series formerly entitled Erosion Surveys (E. S. R., 87, p. 25). No. 23 deals with conditions in Greene County, Ga., by D. P. Powell and C. B. Gay; No. 24 with the Leatherwood Creek demonstration project, Lawrence County, Ind., by D. R. Kunkel, C. A. Engberg, and C. L. Whiteford.

Soil survey of Roseau County, Minnesota, P. R. McMILLER ET AL. (Coop. Minn. Expt. Sta.). (*U. S. Dept. Agr., Bur. Plant Indus. [Soil Survey Rpt.], Ser. 1936, No. 11, pp. 80, pls. 4, figs. 2, maps 2*).

A survey of tobacco soils in Wisconsin, with particular reference to tobacco quality, J. JOHNSON and W. B. OGDEN (*Wisconsin Sta. Res. Bul. 142 (1942), pp. [2]+23, figs. 6*).—Soil samples from 519 tobacco fields in 6 Wisconsin counties and tobacco from 135 of these fields were collected and subjected to analysis and other tests. Variations of from 200 to 800 lb. of potash and from 25 to 225 lb. of phosphorus to the acre were found common. These and similar variations are held to account in large part for the wide variations in yield, quality, and burn (E. S. R., 86, p. 437) of the tobacco crops grown on the land. The potash in the tobacco leaf, upon which burning quality is largely dependent, varied from about 1 to 7 percent, only about 35 percent of the leaf tobacco in the State carrying sufficient potassium to give a satisfactory burning quality. Significant differences between the potash contents of soils and leaf tobaccos of the northern and southern tobacco districts in the State were noted.

The survey leads to the conclusion that the potassium content of fully 70 percent of the tobacco soils in the southern district in particular should be materially increased, either by the addition of more manure, commercial fertilizer (i. e., 3-9-18S at high rates of application to the acre), or by the use of potassium sulfate alone at rates as high as 600 lb. to the acre. Such fertilizers should materially increase the percentage of blunder crops grown in the State. Neither certain nor quick results may always be secured, even with liberal potassium applications, however, on the heavier soils because of such complicating factors as the excessive chlorine content of soils and manures, which lower the burning quality.

The chemical composition of the clay fractions of the black Prairie soils of Minnesota, A. C. CALDWELL and C. O. ROST. (Minn. Expt. Sta.). (*Soil Sci., 53 (1942), No. 4, pp. 249-263*).—The clay fractions from profiles of one Chernozem, seven black Prairie, and one Gray-Brown Podzolic soils were analyzed, and the ratios of silica to sesquioxide, silica to iron oxide, silica to alumina, iron oxide to alumina, and silica to total base were calculated. The clay fractions from any one profile were found, on the whole, very uniform in composition. Differences between profiles were evident and are explained largely on the basis of age and kind of parent material and its mode of deposition. A concentration of iron in the B₁ horizon of all of the seven black Prairie profiles indicated some fractionation of the soil minerals and is considered to offer distinct though limited evidence of podzolization. No such accumulation of iron appeared in the Cher-

nozem profile. The Gray-Brown Podzolic profile had an accumulation of iron in the B₂ horizon greater than that found in the same horizon of any other profile. The higher percentages of soluble silica in the clay fractions of the black Prairie and Gray-Brown Podzolic soils indicated weathering in these soils to be greater than that which had occurred in the Chernozem. The characteristics of the Prairie soils resemble in some respects those both of a Chernozem and of a Gray-Brown Podzolic soil, but differences were sufficiently distinct to be significant and to warrant the separation of the black Prairie soils as a zonal type.

Indication that analysis of the clay and colloidal fraction of a soil may be useful in distinguishing soil series was supplied by the differences in the constituents shown by the Carrington and the Clarion soils.

The hardpan and the claypan in a San Joaquin soil, C. C. NIKIFOROFF and L. T. ALEXANDER. (U. S. D. A.). (*Soil Sci.*, 53 (1942), No. 3, pp. 157-172, figs. 7).—Mechanical, chemical, petrographic, and thermal analyses and field observations led to the following conclusions regarding the formation of pans:

The clay in the clay pan has formed largely by weathering, in place, of the silt and fine sand fractions, with a possibility of a certain increase in content of colloidal material in this pan due to the transfer of such material from other horizons. The clay is not essentially different from that found in the parent material. The hardpan was formed, subsequent to the profile development, by cementation of the soil by iron oxide and silica. Apparently the cementing material was liberated by weathering at the points of cementation. When decemented, the hardpan has the same size distribution in the coarser fractions as the O material, which indicates that it has formed from material similar to that of the O horizon.

An estimate of the time required to form the hardpan is given, and its formation is correlated with the changes of climate during the later part of the Post-Pleistocene interval.

Resistance of clay-adsorbed proteins to proteolytic hydrolysis, L. E. ENSMINGER and J. E. GIESEKING. (Ill. Expt. Sta. coop. Univ. Idaho). (*Soil Sci.*, 53 (1942), No. 3, pp. 205-209).—The adsorption of albumin and hemoglobin by base-exchange clays (Wyoming bentonite and Clarence clay) was found to interfere with the enzymatic hydrolysis of these proteins in both acid pepsin suspensions and alkaline pancreatin suspensions. Kaolinite, a clay mineral with a very low base-exchange capacity, had no significant effect on the hydrolysis of albumin and hemoglobin. The degree of interference of a clay with the enzymatic hydrolysis of a protein appeared to be influenced by the exchange capacity of the clay.

Volume change and pore space of saturated and dry soil clods in relation to different soil types and land utilization, P. I. VLASOFF. (Wash. Expt. Sta. coop. U. S. D. A.). (*Soil Sci.*, 53 (1942), No. 3, pp. 187-193).—A modification of Sideri's cold-saturation methods (E. S. R., 75, p. 18) has been developed for the determination of pore space of soil under natural conditions in the Washington region. Data for pore space and volume changes of nine soil types on soil samples taken from duplicate plats, some situated close together, others widely separated, were obtained by this modified method. These data indicate that for reliable results the study of pore space on heavy-textured soils of the same type must be made on samples obtained from closely adjoining areas. Significant differences in values may be obtained when the sampling areas are far apart. Various land-use practices were found effective in altering the original pore-space capacity of some soils.

A calibrated soil probe for measuring field soil moisture, R. B. ALLYN. (Oreg. Expt. Sta. and U. S. D. A.). (*Soil Sci.*, 53 (1942), No. 4, pp. 273-285, figs. 5).—The probe proper consists essentially of a diamond-shaped blade point

mounted on a shaft, by means of which the blade point can be driven to the desired soil depths. The measurement of the resistance of the soil to rotation of this point, termed "the soil stability," is evaluated in terms of torque in inch-pound units by the use of an especially designed handle which may be attached quickly to the head of the shaft. This stability measurement, when correlated with the corresponding soil moisture content, showed a consistent relation by means of which soil moisture content may be estimated, usually within 0.5 percent, in such heavy soils as were covered in this investigation. A generalized relationship was developed to facilitate the preparation of a soil moisture-stability calibration for an area without the necessity of detailed laboratory work.

The investigation was confined to heavy soils. It is believed, however, that the method will be found satisfactory in soils as light as clay loams and, quite possibly, in much lighter soils.

Soil moisture tensiometer materials and construction, L. A. RICHARDS. (U. S. D. A.). (*Soil Sci.*, 53 (1942), No. 4, pp. 241-248, fig. 1).—General principles involved in the construction and successful operation of tensiometers are discussed. Three instruments which have given satisfactory field and laboratory service are described in some detail, and their construction is shown in dimensioned scale drawings. Filling and testing, manometer scales and zero settings, and the use and limitations of tensiometers are among the topics considered.

Base exchange in soils and in other disperse systems, H. JENNY. (Univ. Calif.). (*Chron. Bot.*, 7 (1942), No. 2, pp. 67-68).—A discussion paper reviewing the development of our knowledge of the base exchange process. The author also points out the relationship of the base exchange mechanism to plant nutrition.

Plant nutrition and the hydrogen ion.—I, Plant nutrients used most effectively in the presence of a significant concentration of hydrogen ions, W. A. ALBRECHT and R. A. SCHROEDER. (Mo. Expt. Sta.). (*Soil Sci.*, 53 (1942), No. 4, pp. 313-327, figs. 7).—Using spinach and potatoes as test plants, under conditions of constant and controlled exchangeable nutrient supply in the soil, the authors observed a mobilization of nutrients into the crop far greater when the soil was acid than when it was neutral. In all instances increased concentrations of many of the various elements were found in the plant tissue, and in some crop yields were increased. The cations showing the behavior noted were calcium, magnesium, strontium, and manganese. The utilization of the potassium and phosphate ions appeared not to be markedly affected by the presence or absence of a H-ion concentration in excess of neutrality. Both the total intake and the concentrations found suggested, however, a precipitation-peptization relationship depending upon the quantity of exchangeable calcium in the soil.

Extraction of auxin from virgin soils, W. S. STEWART, M. G. KEYES, and M. S. ANDERSON. (U. S. D. A.). (*Soil Sci.*, 53 (1942), No. 4, pp. 299-308, fig. 1).—For the purpose of a proximate extraction and assay of auxin in soils, 100 gm. of soil was shaken at intervals for 48 hr. with sufficient limewater to keep the pH between 7 and 8 in a volume of 400 cc. The filtered extract was then concentrated and auxin measured by the standard Avena test. Such determinations were made on the 2 upper horizons of 11 virgin soils representative of 4 of the great soil groups. In very fertile midwestern surface and subsurface soils, auxin was found to the extent of about 0.175 μg . per kilogram of soil (indoleacetic acid equivalents). In the less fertile soils, considerably less auxin was found in the surface horizons and little if any in the second horizon. The presence of auxin in soil as yet has not been generally conceded to be beneficial for plant growth. Its greater abundance in the more fertile surface and its near absence in poor soils of low organic matter content, however, point to its possible association with soil fertility.

Conservation practices in Oklahoma, W. H. MCPHETERS. (Okla. A. and M. Col.). (*Agr. Engin.*, 22 (1941), No. 8, p. 280).—Terracing is emphasized, together with contour farming, which is considered an inseparable part of this measure of protection. Crop rotation and the plowing under instead of burning of vegetable matter is recommended. Late-fall, winter, and early-spring plowing is practiced to conserve water and to allow decomposition of the incorporated organic matter. The use of the terrace outlet spreader wherever possible is recommended, with masonry or concrete outlet protection where the spreader cannot be used. As between channel and ridge terraces, that is considered the better which the farmer can build the cheaper with the power and machinery available. Where there are no pastures into which to empty terrace water, new pastures or a small addition to a pasture are proposed. Farm ponds are being urged and many are being built, especially in connection with a range program.

Recommended conservation practices in Texas, M. R. BENTLEY. (Tex. A. and M. Col.). (*Agr. Engin.*, 22 (1941), No. 8, p. 284).—Adaptations of general practices to local requirements are described.

Conservation in a county's "comeback," F. N. FARRINGTON (*Agr. Engin.*, 22 (1941), No. 10, pp. 355-356, figs. 6).—Striking results of a conservation program applied to an area considered to be approaching a worn-out condition are described. Terracing and plowing under of winter legumes are credited with the greater part of the marked increases in crop and livestock production. An illustration shows a field abandoned as worthless for 15 yr., then terraced and planted to Austrian Winter peas, which were plowed under and followed by cotton. The last-named crop then made a bale to the acre.

The test of terracing practices, E. L. ARNOLD. (Univ. Ark.). (*Agr. Engin.*, 22 (1941), No. 7, p. 261).—In this brief discussion the author calls attention to the fact that a terrace satisfactory from the viewpoint of erosion control engineering may be so inconvenient from the farming viewpoint as to lead to abandonment of plowing and tillage on the contour, especially on irregular and uneven slopes usually found in the less prosperous farming areas where a slight increase in the cost of farming may make the difference between profit and loss. As one of the possible remedies, the author suggests that channel terraces be made where the terraces curve about a high place but ridge terraces where the curve is carried around a low place, thereby eliminating some curves and lessening others. The author believes this type of terrace construction would give protection as effective as that given by the present channel terrace. It would be a little harder to build, but on irregular slopes would make farming with the terraces simpler.

Infiltration studies in the Pecos River watershed, New Mexico and Texas, H. L. SMITH and L. B. LEOPOLD. (U. S. D. A.). (*Soil Sci.*, 53 (1942), No. 3, pp. 195-204, figs. 2).—Artificial rainfall was applied to 264 plats, 12 by 30 in., representing various soil and vegetal types in the Pecos watershed. In general, the soils were shallow, calcareous, heavy in texture, slightly alkaline in reaction (pH 7.6-8.5), and developed under an annual rainfall of 12-18 in. The predominant vegetal types were desert shrub, grassland, and piñon-juniper woodland. Organic matter content was determined by Allison's modification (E. S. R., 74, p. 445) of the Schollenberger rapid-titration method (E. S. R., 65, p. 504).

Soil samples from 126 plats were analyzed in the laboratory, and the data analyzed by statistical methods. The investigation showed a highly significant positive linear correlation between the final infiltration rate and vegetal density. The rate of infiltration showed a highly significant negative correlation with

dispersion ratio, proportion of dispersed clay, and silt plus clay. The 5- μ clay content showed a significant negative correlation with the final rate of infiltration.

Basic principles outlined for maintaining soil fertility on irrigated land in Colorado. R. GARDNER and D. W. ROBERTSON (*Colo. Farm Bul. [Colorado Sta.], 4 (1942), No. 1, pp. 3-5*).—The requirements of lands in which both soil fertility and water supply are extremely variable are briefly discussed. The need for legumes to maintain adequate organic matter and nitrogen supplies is noted especially, and some illustrative results of fertility experiments are indicated.

The fertility of our soils. T. E. STOA (*North Dakota Sta. Bimo. Bul., 4 (1942), No. 4, pp. 28-31*).—Results of fertilizer experiments with manure, superphosphate and other P carriers, Ca, and K are tabulated, and their practical significance is briefly indicated.

Organic phosphorus in soils.—II, The nature of the organic phosphorus compounds. A, Nucleic acid derivatives. B, Phytin. III, The decomposition of some organic phosphorus compounds in soil cultures (*Soil Sci., 51 (1941), No. 3, pp. 235-248; 4, pp. 323-329*).—These papers extend work noted on page 174 and that of Wrenshall and McKibbin (*E. S. R., 79, p. 19*).

Paper 2, by C. L. Wrenshall and W. J. Dyer, records in part A an investigation into the nature of the nucleic acids found in the phosphorus-containing organic substances isolated from soil, while part B deals with the isolation and identification of phytin.

The N/P ratios were very low, indicating the presence of such nonnitrogenous compounds as phytin. Dilute acid hydrolysis released only small quantities of a purine identified as xanthine. A pentose, presumably ribose, and phosphoric acid were also released by this hydrolysis. Guanine was isolated after drastic acid hydrolysis. The quantity obtained accounted for most of the nitrogen of the preparation. No other purine or pyrimidine substances were detected.

With reference to nucleic acid derivatives in soil, it is pointed out that "these substances have not been proved to account for an appreciable part of the organic phosphorus, although it is highly probable that they do." A difference between the soil compounds and ordinary nucleic acid derivatives is noted in the difficulty of releasing purines from the soil nucleic acids by acid hydrolysis.

Much of the organic phosphorus of the soil nucleotide preparation was precipitated as a ferric salt in N/6 HCl. The same material was precipitated from brominated soil extracts under suitable conditions and was obtained in an apparently pure condition. This product was free of nitrogen and contained phosphorus and iron in the same ratio as did ferric phytate similarly prepared. The sodium salt of the soil product gave the test for phytin and corresponded to authentic sodium phytate in titration with ferric chloride and in its behavior toward enzyme extracts.

It was shown that phytic acid forms two distinct ferric salts, corresponding approximately to the formulae $[\text{C}_6\text{H}_5(\text{PO}_4)_3]_2\text{Fe}_3$ and $\text{C}_6\text{H}_5(\text{PO}_4)_3\text{Fe}$. It was found also that a compound of aluminum with phytic acid was insoluble in acid solution. It was observed that the preparations of ferric phytate and aluminum phytate were not subject to dephosphorylation by brain phytase in acid solution. It was concluded that the compound obtained from soil is ferric phytate. The probability that phytic acid is a common constituent of soils and that in acid soils it may exist in combination with iron and aluminum is pointed out.

In the work recorded in paper 3, by Dyer and Wrenshall, organic phosphorus compounds were mixed with soil and the mixtures were stored in a dark room at $23^{\circ} \pm 1^{\circ}$ C. Water was added to the cultures to provide a moisture content approaching the field moisture capacity, and more was added occasionally to replace that lost by evaporation. From time to time samples were withdrawn, air-dried, and analyzed for soluble phosphate.

The results of various experiments of this nature indicated that inorganic phosphate added to soil is not rapidly built up into organic compounds but remains as inorganic phosphate, and that the organic phosphorus of the soil represents an accumulation of stable forms and not a labile fraction maintained by synthetic activities. It appears to be the inactive end product of soil processes, relatively unavailable to both plants and micro-organisms. Ribonucleic acid and the four ribonucleotides, in contrast to the soil product, were rapidly dephosphorylated in soil. Two soils, however, differed widely in their power to decompose nucleic acid. Phytin is relatively resistant to decomposition in soil. Inositol phosphates other than phytin are undoubtedly formed during the dephosphorylation of phytin. Whether these are more or less resistant than phytin itself has not yet been ascertained. The organic phosphorus of manure resembles phytin in its rate of dephosphorylation in soil cultures.

Effect of phosphate on the hardness of soil, J. GREEN (*Amer. Fert.*, 96 (1942), No. 4, pp. 8, 24, figs. 2).—Based on laboratory experiments of measuring, crushing, and tensile strength of prepared soil blocks treated and untreated with phosphate, the author concludes that even a large amount of phosphate does not harden the soil.

60 percent muriate recommended as most economical, W. B. ANDREWS (*Farm Res. [Mississippi Sta.]*, 5 (1942), No. 3, p. 7).—It is pointed out that the farmer purchasing potassium chloride diluted with dolomite pays about \$15 per ton for a liming material which can be bought as such for from \$3 to \$4 per ton; that sand used as a diluent, though entirely worthless, is also paid for in purchasing a potassium chloride fertilizer diluted with it; and that the sodium chloride forming about half of the mixture sold as manure salts is of unknown fertilizer value.

Liming Missouri soils, O. T. COLEMAN and A. W. KLEMM (*Missouri Sta. Cir.* 218 (1941), pp. 30, figs. 14).—This is a more or less popular treatment of lime requirement and its measurement; economic aspects of the use of lime; production of agricultural limestone, including testing of limestone for density and sand content; burning of limestone; distributing and spreading; etc.

Effects of applying common salt to a muck soil on the yield, composition, and quality of certain vegetable crops and on the composition of the soil producing them, P. M. HARMER and E. J. BENNE (*Mich. Expt. Sta.*). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 11, pp. 952-979, figs. 3).—Studies on Michigan muck soil, begun in 1924, have shown that 12 crops give yield increases from application of ordinary salt when a phosphate-potash fertilizer mixture is also applied. Table beets, mangels, Swiss chard, sugar beets, celery, and turnips were greatly benefited. Cabbage, celeriac, kale, kohlrabi, radishes, and rape showed some increase in growth. Chemical analyses of the crops showed very marked increases in the Na_2O and Cl contents of these crops, with little or no decrease in K_2O content, no apparent effect on the percentage sugar content and the purity of beets, decreases in content of nitrogen, CaO , and MgO , and slight increase in P_2O_5 content of celery and sugar beets. The total amount of K_2O removed in the crop was slightly decreased in sugar beets, unchanged in table beets, and showed a marked increase in cabbage, celery, and turnips. Crops which showed no benefit from salt, applied with phosphate and potash,

included asparagus, barley, broccoli, Brussels sprouts, carrots, corn, lettuce, oats, onions, parsley, parsnips, peppermint, potatoes, spinach, and tomatoes.

In the metabolism of salt-responsive crops, the sodium ion appears nearly as much needed as a nutrient as is the potassium ion. The data indicate that the so-called "luxury consumption" of potash by a salt-responsive crop may be due at least partially to a soda-starvation of the crop, and that, in the absence of sufficient potash, a salt-responsive crop may develop a luxury consumption of soda. The application of salt, in the absence of potash, produced very low yields of all crops grown, with an unhealthy decaying growth of the roots, a chlorosis of foliage indicative of potash deficiency, and a marked decrease in sugar content and purity in beets.

Boron distribution in soils and related data, R. R. WHEATSTONE, W. O. ROBINSON, and H. G. BYERS (*U. S. Dept. Agr., Tech. Bul. 797 (1942), pp. 32, fig. 1*).—Analytical methods for the determination of phosphoric acid-soluble and of total and water-soluble boron in soils are described.

Boron was found in all of 300 soil samples, the total ranging from 4 to 88 p. p. m. and averaging 30 p. p. m. for soils of normal rainfall. Acid-soluble boron (considered to be presumably the maximum available boron) varied from 0.4 to 64.8 p. p. m., averaging 17.1 p. p. m. About 1 p. p. m. is water-soluble. Acid-insoluble boron, that stored in resistant minerals, varied from 0 to 61 p. p. m., with an average of 13.9 p. p. m. The quantity of boron in soils was shown to be dependent on parent material and on weathering. Soils derived from alluvium, limestone, shale, and glacial drift were found high, those from igneous rocks and unconsolidated sediments low, in boron. Podzols, Half-Bog, muck, and Red and Yellow Podzolic soils examined were low in acid-soluble and relatively high in acid-insoluble boron. Alluvial, Gray-Brown Podzolic, Prairie, Chestnut, Brown, and Chernozem soils were high in boron, most of it acid-soluble. Acid-soluble boron increased with colloid content and with increasing pH. Injury to apples, alfalfa, celery, and beets in Oregon, West Virginia, and North Carolina was found associated with low boron content of the soil. If a soil is low in acid-soluble boron it is considered likely to show boron deficiency. An arbitrary lower limit of p. p. m. is suggested. Three large areas in the United States are likely to show boron deficiency—Atlantic and Gulf coasts from Maine to Texas; northern Minnesota, Wisconsin, and Michigan; and California and the Pacific Northwestern States.

Boron content of hickory and some other trees, W. O. ROBINSON and G. EDGINGTON. (*U. S. D. A.*). (*Soil Sci., 53 (1942), No. 4, pp. 309-312*).—Because of the variable composition of its leaves, the hickory tree (distributed from Maine to Florida and westward to Iowa) is a very useful indicator of available inorganic elements. The leaves are far less liable to soil contamination than are those of most plants, a very serious objection to broad-leaved, low-growing plants such as beans. The data tabulated cover the boron content of the leaves not only of hickory trees sampled at widely separated points but also of various other trees from white birch (Maine) to rubber trees (Honduras) and herbaceous plants of a number of species. The acid-soluble boron of the soil is also stated in most instances.

Adsorption and fixation of copper in some sandy soils of central Florida, V. C. JAMISON. (*Fla. Expt. Sta.*). (*Soil Sci., 53 (1942), No. 4, pp. 287-297, figs. 2*).—The adsorption of copper from copper salt solutions by several sandy soils of Florida was found a function of copper concentration and only roughly related to the exchange capacities. The soils studied showed a marked capacity to hold adsorbed copper in slowly replaceable as well as in slowly soluble forms. The distinction between fixed and exchangeable copper was

not easily made. The recovery of copper by a single extraction with a replacing salt solution was not a reliable measure of fixation of copper in nonreplaceable forms. The copper removed by prolonged leaching with a salt solution appeared to be related in part to the cation concentration. It appeared that copper can be mobilized in soil by the dispersive effect of sodium salts on the organic colloids, acetate being more effective than chloride. Although phosphatic radicals capable of giving the molybdenum test were not removed by washing Norfolk fine sand with dilute HCl, the phosphate retained apparently did not affect the retention of copper in the soil. The sand itself may retain some copper, but the amount is far less at from pH 3 to 5 than that which can be attributed to the organic matter. Time of solution contact influenced the retention of copper, but air-drying the soil had no significant effect.

AGRICULTURAL BOTANY

[Botanical studies by the Iowa Station] (*Iowa Sta. Rpt. 1941, pts. 1, pp. 119, 123-126, figs. 3; 2, pp. 49-53, fig. 1*).—Reports of progress in studies by C. H. Werkman, A. Hayden, C. S. Reddy, J. N. Martin, W. E. Loomis, and R. A. Bair are presented on (pt. 1) nitrogen and accessory growth factor requirements of bacteria, especially the lactic and propionic acid forms, and distribution and ecology of plants in the waterfowl breeding areas of Iowa; and (pt. 2) physiological responses of the growing plant and the pathogen to chemical treatments of seed corn; comparison of the stem and root development of certain corn hybrids with their single crosses and inbreds as to rate of development of the embryonic axis, length of the period from planting to appearance of tassel primordia, and size of cells and nuclei of meristems; translocation gradients in the corn plant and their relation to photosynthesis and yield; interaction of water, growth, hormones, and food supplies in corn development; and germination of corn pollen.

[Botanical papers] (*Iowa Acad. Sci. Proc., 48 (1941), pp. 117-121, 159-173, 191-193, 194, 195, 196*).—Of botanical interest are the two papers, *Adaptation Studies of Plants for Soil Conservation Purposes in Southern Iowa*, by J. W. Aikman and I. L. Boyd (pp. 117-121) (Iowa State Col. and U. S. D. A.), and *The Development of an Educational Program in Iowa State Parks*, by I. E. Melhus, J. L. Fults, and E. A. White (pp. 159-173) (Iowa State Col.); and abstracts of the following: *Tensiometers for Following Soil Moisture Conditions in the Field*, by R. A. Bair (p. 191), *A Simple Method for the Germination of Pollen of Maize and Potato*, by R. A. Bair and W. E. Loomis (pp. 191-192), *The Use of Tetrachlorethane in the Eradication of the European Bindweed*, by A. L. Bakke (p. 192), *The Earliest Known Epiphytotic of Rust in Iowa*, by M. A. Corkle and I. E. Melhus (pp. 192-193), *A Preliminary Report on the Developmental Anatomy of Red Clover, *Trifolium pratense* L.*, by H. J. Romm (p. 195), *The Critical Period for Floral Initiation in *Tulipa**, by J. E. Sass (p. 196), and *Epidermal Patterns in Haploid, Diploid, and Tetraploid Tomatoes*, by J. E. Sass and E. W. Lindstrom (p. 196) (all Iowa State Col.), and *Water and Salt Balance in the Growth of Annual Plants*, by W. F. Loehwing (p. 194).

Plant science formulae: A reference book for plant science laboratories (including bacteriology), R. C. McLEAN and W. R. IVIMEY COOK (London: Macmillan & Co., 1941, pp. VII+203).

Advances in botany, T. G. PHILLIPS. (Univ. N. H.). (*Chem. and Engin. News*, 20 (1942), No. 3, pp. 170-175, figs. 7).—This is a semipopular review (62

references) of miscellaneous recent botanical research, including many phases, such as organic acids in intermediary plant metabolism, isotopes of various elements, minerals in metabolism, and viruses.

The isolation from soil of spore-forming bacteria which produce bactericidal substances, J. L. STOKES and C. R. WOODWARD, JR. (*Jour. Bact.*, 43 (1942), No. 2, pp. 253-263, figs. 2).—A simple rapid method for isolating antagonistic micro-organisms from soil is described by which 24 bacillus strains of two distinct groups were obtained, viz, an "active" group possessing readily demonstrable bactericidal properties and an "inactive" group not exhibiting such properties. Strains of the active group formed H_2S in peptone media, failed to hydrolyze starch, and were gram-negative; the inactive group possessed the reverse characters. The active agents (described) were bactericidal in very small amounts on gram-positive bacteria, but larger amounts were necessary to inhibit or destroy gram-negative bacteria. The agents obtained from the various active strains appeared to have similar antibacterial properties. In culture the maximum bactericidal material was reached in about 6 days, most of it either in suspension or associated with the vegetative cells, spores, and cellular debris and separable from the medium by centrifugation.

The selective bacteriostatic effect of slow oxidizing agents, W. L. MALLMANN, W. E. BOTWRIGHT, and E. S. CHURCHILL. (Mich. Expt. Sta.). (*Jour. Infect. Diseases*, 69 (1941), No. 3, pp. 215-219).—It is shown that the slow-oxidizing agents K dichromate and Na azide exert a bacteriostatic effect on gram-negative bacteria. By using appropriate dilution of such agents it was possible to suppress the growth of gram-negative bacteria and allow the development of gram-positive organisms. The gram-positive cocci, particularly the streptococci, appear to be able to tolerate the slow-oxidizing agents more than the gram-positive sporiferous bacteria. Successful use of these agents can be made in selective nutrient media to allow growth of gram-positive bacteria from mixtures.

A bacteriologist looks at chlorine, S. M. COSTIGAN (*Jour. Amer. Water Works Assoc.*, 34 (1942), No. 3, pp. 353-364).—The author reviews the literature (39 references) and considers this problem in the line of her experiences with Cl and its compounds as bactericides. Discussion by J. W. Krasauskas (pp. 361-364) follows.

The killing of bacterial spores in fluids by agitation with small inert particles, H. R. CURBAN and F. R. EVANS. (U. S. D. A.). (*Jour. Bact.*, 43 (1942), No. 2, pp. 125-133, pl. 1, fig. 1).—Spores and vegetative forms were progressively destroyed when their fluid suspensions were agitated long and vigorously with finely divided abrasives, the cumulative result of abrasion and repeated collisions being a gradual disintegration of the cells attended by a material decrease in the opacity of the suspension on reduction of the cells to a very fine state of division. Vegetative forms were more rapidly killed than spores, and foam-producing substances reduced somewhat the germicidal efficiency of the shaking procedures. Spore resistance to mechanical destruction was apparently not correlated with thermal resistance.

Advances in enzymology and related subjects, II, edited by F. F. NORD and C. H. WERKMAN (*New York: Interscience Pubs., Inc.*, 1942, vol. 2, pp. VIII+374, figs. 23).—The following articles in this volume of the series (E. S. R., 85, p. 173) are of interest to agricultural botany: Bacterial Viruses (Bacteriophages), by M. Delbrück (pp. 1-32); The Chemistry of Tea-Fermentation, by E. A. Houghton Roberts (pp. 113-133); Heterotrophic Assimilation of Carbon Dioxide [by bacteria and by animal tissue], by C. H. Werkman and H. G. Wood (pp. 135-182);

Atmung Gärung und die sich daran beteiligenden Enzyme von *Aspergillus* [Respiration, Fermentation, and the Participating Enzymes of *Aspergillus*], by H. Tamiya (pp. 183-238); and Cellulose Decomposition by Microorganisms, by A. G. Normal and W. H. Fuller (pp. 239-264). Bibliographies terminate the individual sections.

Microbiological studies of cacao fermentation, S. HOYNAK, T. S. POLANSKY, and R. W. STONE. (Pa. State Col.). (*Food Res.*, 6 (1941), No. 5, pp. 471-479).—The chemical analyses reported are said to conform fairly well to the results of other investigators. The main fermentative activity is carried out by yeasts. Since pure cultures of these fungi possess the ability to form acetic acid as well as alcohol, it is believed probable that they may be responsible for the first two stages of fermentation instead of the alcoholic stage only. No typical acetic bacteria were found, but some activity on the part of bacteria may be important in that it causes a disappearance of the high acetic acid content generally considered an unfavorable characteristic for commercial purposes. The final product was not materially different whether fermentation was at 38° C. or at room temperature, but at 45° underfermentation became apparent. The fact that a heterogeneous flora can bring about a satisfactory fermentation appears to indicate that the type of micro-organism may not be as important as the chemical composition and condition of the bean.

The significance of fat in sulfur oxidation by *Thiobacillus thiooxidans*, W. W. UMBRETT, H. R. VOGEL, and K. G. VOGLER. (Univ. Wis.). (*Jour. Bact.*, 43 (1942), No. 2, pp. 141-148).—It is concluded from the data presented that this obligate autotrophic S-oxidizing organism oxidizes insoluble S after dissolving it in the fat globule located at the ends of the cell. During the process this fat globule is placed in contact with the S particle in such a manner that S dissolves in it and is taken into the cell for oxidation. Though it is true that only soluble food material can be oxidized in a bacterial cell, these materials need not be soluble in the medium employed for growth but may, as here shown, be soluble in some constituent of the cell itself.

A method for measuring bacterial pigments by the use of the spectrophotometer and the photoelectric colorimeter, G. L. STAHLY, C. L. SESLER, and W. R. BRODE. (Ohio State Univ.). (*Jour. Bact.*, 43 (1942), No. 2, pp. 149-154, fig. 1).—The method described for use under various environmental conditions is said to be simple and rapid and to give reproducible values, if reasonable care is exercised, and much greater accuracy than the method of gross visual observation.

Behavior of microorganisms at subfreezing temperatures.—III, Influence of sucrose and hydrogen-ion concentrations, V. H. McFARLANE. (U. S. D. A.). (*Food Res.*, 6 (1941), No. 5, pp. 481-492, figs. 2).—Using a cold-tolerant *Saccharomyces* species and *Escherichia coli*, the numbers of viable cells surviving different storage intervals at -10° and -20° C. at varying concentrations of pH and sucrose are recorded.

Air-borne fungus spores, T. B. BERNSTEIN and S. M. FEINBERG (*Jour. Allergy*, 13 (1942), No. 3, pp. 231-241, figs. 9).—In a daily study of the mold content of Chicago area air (5 yr.) from the standpoint of allergy agents, *Alternaria* and *Hormodendrum* constituted about 72 percent of all the spores growing on culture media. Some fungi showed no particular seasonal tendency, but those with high incidence displayed marked seasonal fluctuations. The seasons varied for the different fungi and also from year to year in length and in time of onset and termination. Such marked variations usually were not observed with respect to pollen seasons.

The effect of light on taxonomic characters in *Fusarium*, W. C. SNYDER and H. N. HANSEN. (Univ. Calif.). (*Mycologia*, 33 (1941), No. 6, pp. 580-591, figs. 2).—Marked differences in the ordinarily used taxonomic characters were revealed when 10 strains of *F. solani*, *F. oxysporum*, and *F. avenaceum* (representing 3 sections of the genus) were grown in light v. darkness. Not only the quality of the colony and morphological characters were affected, but also the quantity and to a certain degree the occurrence of such characters as perithecial primordia. Evidence given indicates that the effect of light is produced on that portion of the thallus which is actively growing during exposure. Single spore cultures subjected to light only for the first 4 days of growth failed to develop in the same manner as those allowed to remain in the light. It is concluded that such characters as color, zonation, colony type, presence or absence of sporodochia; size, shape, and septation of macroconidia; and even the occurrence of a perithecial stage, cannot be employed successfully in taxonomy unless these fungi are grown in adequate light.

The successful revival of *Nostoc* commune from a herbarium specimen eighty-seven years old, C. B. LIPMAN. (Univ. Calif.). (*Bul. Torrey Bot. Club*, 68 (1941), No. 9, pp. 664-666).

Contribución a la bibliografía botánica Argentina, I [Contribution to the botanical bibliography of Argentina, I], A. CASTILLANOS and R. A. PÉREZ-MOREAU (*Lilloa*, 7 (1941), pp. 549, pl. 1).—This bibliography continues (*E. S. R.*, 86, p. 601) with the Dicotyledoneae (Piperaceae through the Compositae), completing part 1; and presents part 2, Phytogeography. A map of the country and subject and author indexes are provided.

Lista preliminar de las plantas medicinales de El Salvador [Preliminary list of the medicinal plants of San Salvador] (*Café el Salvador*, 11 (1941), No. 132, pp. 754-761).—An annotated list.

A flora of Arizona and New Mexico, I. TIDESTROM and T. KITTELL (*Washington, D. C.: Catholic Univ. Amer. Press*, 1941, pp. XXVI+897, pl. [1], figs. [16]).—This volume is devoted to the flora of New Mexico and Arizona, including certain parts of Utah and other places in sight of or bordering Arizona which floristically belong with the latter State. The work of some of the early explorers in this region is briefly outlined. Numerous keys to the larger groups and to the 898 genera and 3,975 species represented in the volume and an index to genera and common names of plants are provided.

A taxonomic treatment of *Lespedeza* in Oklahoma, J. D. NORMAN (*Okla. Univ. Bul.* 850, n. ser. (1941), p. 26).—Abstract of an S2-page thesis.

Preliminary findings on the use of plant hormones as seed treatments for sugar beets, S. T. DEXTER (*Michigan Sta. Quart. Bul.*, 24 (1942), No. 3, pp. 245-248).—"For several years the writer has conducted preliminary experiments with these materials in the greenhouse and in the seed germinator. The results, insofar as seed treatments are concerned, have not been promising."

Guanine and factor Z_1 , growth substances for *Phycomyces*, W. J. ROBINS and F. KAVANAGH (*Natl. Acad. Sci. Proc.*, 28 (1942), No. 1, pp. 4-8).—This is a progress report on further work with factor Z_1 (*E. S. R.*, 84, p. 305), on the basis of which (with studies by others), though its relation to guanine is still problematical, several possibilities are suggested and briefly discussed.

Influence of vitamin B_1 on the growth of *Agrostis tenuis* and *Brassica alba*, D. G. CLARK. (Cornell Univ.). (*Plant Physiol.*, 17 (1942), No. 1, pp. 137-140).—"It seems reasonable to conclude from these data that vitamin B_1 had no significant influence on the growth of *B. alba* in either pure quartz, sand, or soil, nor on *A. tenuis* in soil under the experimental conditions described."

Effect of vitamin B₁ on the growth of rice plants, C. E. MINABIE. (Tex. Expt. Sta.). (*Plant Physiol.*, 17 (1942), No. 1, pp. 141-142).—"Apparently rice belongs to that group of plants which synthesize sufficient vitamin B₁ to satisfy their needs, and when growing under favorable conditions it is not stimulated by applications of vitamin B₁ to the substrate in which the rice roots are growing."

Studies of the growth of pollen with respect to temperature, auxins, colchicine and vitamin B₁, P. F. SMITH. (Univ. Calif.). (*Amer. Jour. Bot.*, 29 (1942), No. 1, pp. 56-66, figs. 24).—Using pollen from a single flower in each case to eliminate variability from differing physiological ages, the pollen of all species studied (sweetpea, snapdragon, *Tradescantia occidentalis*, and *Bryophyllum daegremontianum*) showed an increase in diameter of tubes corresponding to an increase in environmental temperature. The substances used (3-indoleacetic acid, 3-indolebutyric acid, naphthaleneacetic acid, vitamin B₁, and colchicine) were favorable additions to the culture medium, with only moderate stimulation in snapdragon but with much greater effects on both germination and tube elongation in *Bryophyllum*. The greatest auxin stimulation occurred at 25° C., which was also the optimum temperature for pollen growth in these species. Concentrations weaker than 1:50,000 were favorably stimulative, but all stronger ones were toxic. No evidence of favorable stimulation by vitamin B₁ was found. Colchicine was depressive to both germination and tube elongation at all temperatures used. Snapdragon pollen exhibited the peculiar response of bloating of the tubes to certain unfavorable growth factors, viz, temperatures of 30° or more, presence of colchicine, high acidity, and "old" pollen (dehiscence several hours before inoculation).

Occurrence of hydrogenase in nitrogen-fixing organisms, A. S. PHELPS and P. W. WILSON. (Univ. Wis.). (*Soc. Expt. Biol. and Med. Proc.*, 47 (1941), No. 2, pp. 473-476).—The existence of hydrogenase, the enzyme activating molecular H₂, was demonstrated in *Azotobacter* cultures by a methylene blue reduction method as well as by measurements of H₂ uptake in the Warburg microrespirometer. It was found in cells grown in the presence or absence of H₂ and using either free or combined N. Cells of the pea organism (*Rhizobium leguminosarum*) taken directly from the nodule possessed the enzyme, but those grown on the usual laboratory media did not.

The relationship of catalase ratio to germination of X-rayed seed as an example of pretreatments, B. N. SINGH (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 11, pp. 1014-1016).—The intimate association and interdependence of catalase ratio and germination capacity of seeds were greatly stressed by their identical behavior in several crop seeds (corn, wheat, *Cicer arietinum*, and *Carthamus tinctorius*) differing widely in their biochemical constitution. It is believed that, as a sensitive test of the metabolic status of tissues and as a more or less precise indicator of the physiological responses of developing seeds to pre-sowing treatments like irradiation, the catalase ratio may serve as a useful guide in some agronomic practices and be applicable at a far earlier stage than the germination test.

Seed treatment for damaged and sprouted wheat, W. E. BRENTZEL (*North Dakota Sta. Bimo. Bul.*, 4 (1942), No. 4, pp. 16-20, fig. 1).—The types of damage included puffy bran over the germ but without bran rupture, ruptured bran over the germ but not sprouted, and sprouted seed. In treating damaged wheat, germination was improved by New Improved Ceresan, seed with short sprouts benefiting more than the less severely damaged seed. Formaldehyde seemed to injure the germs, usually caused markedly reduced germinability, increased the number of deformed plants, and severely injured seed with short

sprouts. Damaged seed treated with New Improved Ceresan germinated more uniformly than nontreated controls, whereas that treated with formaldehyde germinated more unevenly and the plants lacked vigor.

Relation of seed weight to vegetative growth, differentiation, and yield in plants, S. W. OEXEMANN (*Amer. Jour. Bot.*, 29 (1942), No. 1, pp. 72-81, figs. 8).

Influence of soil temperature on the development of colonial bent grass, I. H. STUCKEY. (R. I. Expt. Sta.). (*Plant Physiol.*, 17 (1942), No. 1, pp. 116-122, figs. 5).—Seedlings of colonial bentgrass, Kentucky bluegrass, and timothy, grown in tanks of nutrient solutions with the roots at three temperatures (45°, 60°, and 90° C.) and the tops at one temperature, exhibited striking differences in development. Colonial bentgrass grown for a longer time in soil with the roots at three different temperatures showed the same differences. The root growth resembled that found out of doors when the soil temperature was approximately the same as the experimental temperature. Root maturation was accelerated by the high soil temperatures and occurred before any extensive ramification of roots took place in those plants grown at the highest temperature. Death of plants at the highest temperature was attributed to early maturation and death of the root system.

Hydrogen-ion concentration and the initiation of growth, C. J. CORUM (*Ohio Jour. Sci.*, 41 (1941), No. 5, pp. 389-396, figs. 2).—*Rhizopus sinuatus* spores and potato tubers—two types of asexual reproductive units—were investigated, a bimodal curve for the effect of pH concentration on growth initiation being obtained for both. For the mold the minimum of the curve was at about pH 5, to sprouting of the tubers about pH 7. H-ions were relatively more toxic to potato tissue than to the mold spores, whereas with hydroxyl-ions the reactions were the reverse. The effect of pH on growth initiation is considered to be directly related to its effect on the hydration of the biocolloids of the protoplasm of the plant tissues concerned.

A round-table discussion: General aspects of plant nutrition ([*Athens, Ga.*]: *Amer. Soc. Plant Physiol., South Sect.*, [1941], pp. [1]+II+37).—The following papers, with discussions, are presented: The Role of Major and Minor Nutrients and Accessory Substances in Plant Nutrition, by J. R. Jackson (pp. 5-11) (Ala. Polytech. Inst.); The Soil Factor in Plant Nutrition, by L. D. Bayer (pp. 13-18) (Univ. N. C.); Tests on the Plant as Indicators of the Nutritional Needs for Horticultural Crops, by E. M. Emmert (pp. 20-28) (Univ. Ky.); and Plant Nutrition From a Commercial Viewpoint, by S. F. Thornton (pp. 30-35).

Natural root grafts in New Zealand trees, A. D. BEEDIE (*Roy. Soc. New Zeal., Trans. and Proc.*, 71 (1941), No. 3, pp. 199-203, pl. 1, figs. 2).—Since records of such phenomena in New Zealand trees have not been published, these notes are presented to summarize the results of investigations by the author during the preceding 6 yr. in which definite grafts between root systems have been found in at least 30 indigenous species of woody plants.

Plant-tissue cultures, R. L. WEINTRAUB (*Smithson. Inst. Ann. Rpt.*, 1940, pp. 357-368, pls. 3, figs. 5).—This is a general review, with particular reference to "the highlights of the work of the past four decades," calling attention to the outstanding problems and achievements of the study of plant-tissue cultures and the establishment of a secure experimental foundation for further research.

Sur la culture du tissu cambial de carotte [Culture of the cambial tissue of the carrot], R. J. GAUTHERET (*Compt. Rend. Soc. Biol. [Paris]*, 134 (1940), No. 7, pp. 398-400).—The isolated tissue was successfully cultured under aseptic conditions, being transformed in the course of its development into a homo-

geneous tissue without polarity or structural relation to the tissue from which it was derived. Carrot juice was toxic to the tissue culture, but yeast extract favored its growth.

Water loss from excised leaves, J. SHAFER, JR. (Cornell Univ.). (*Amer. Jour. Bot.*, 29 (1942), No. 1, pp. 89-91, figs. 2).—When excised leaves of various inbred and hybrid corn seedlings were weighed repeatedly until the water-loss rate became constant, the various statistics calculated from these data were independent of pedigree. Thus no real differences among strains with regard to water loss were found. The data seemed to fall in a straight line curve when the logarithm of stomatal transpiration was plotted against time. It is concluded that such a semilog relationship between water loss and time is general for excised leaves and for living plants unable to absorb water.

The relation of moisture content to freezing injury in Rival and Mindum wheats, E. A. HELGESON and K. L. BLANCHARD (North Dakota Sta. Bimo. Bul., 4 (1942), No. 4, pp. 15-16).—In this preliminary test, with controlled moisture levels of 20-50 percent and freezing at -20° C. for 6 hr., marked resistance of wheat seed at the lower moisture levels and marked susceptibility to injury at the higher levels were obtained, Mindum appearing less resistant than Rival at the higher moistures. It seems clear that the wheats tested would probably not be injured by freezing at any moisture content apt to occur under ordinary harvest or storage conditions.

Effects of some chemically inert dusts upon the transpiration rate of yellow coleus plants, E. W. BEASLEY. (Tex. Expt. Sta.). (*Plant Physiol.*, 17 (1942), No. 1, pp. 101-108, figs. 3).—Results of this study of Bancroft clay, fine and coarse talc, and silica, indicated that usually the only effect was an increase in night water loss, and then only when dusts with fine particles (Bancroft clay and fine talc) were applied to the under, stoma-bearing leaf surfaces. Dusts on the upper surfaces had no effect, nor did dusts applied at midnight when presumably the stomata were closed. The daytime rate of transpiration was slightly affected by Bancroft clay only. Since stomata occur only on the lower leaf surfaces, the results indicate an effect on stomatal transpiration, probably the action of the dust particles in preventing complete closure at night. The stomatal openings are larger than most of the particles of the two finer dusts. The smaller dust particles had the greater effect on water loss, and the younger and more tender plants showed a greater response to treatment. Dusts would apparently have little effect on the transpiration rate of hardy plants in the field.

Mineral nutrition of plants, F. B. CHANDLER and S. M. RALEIGH (Maine Sta. Bul. 405 (1941), p. 510).—A brief progress report.

Influence of carbon dioxide on response of *Aspergillus niger* to trace elements, R. A. STEINBERG. (U. S. D. A.). (*Plant Physiol.*, 17 (1942), No. 1, pp. 129-132).—Using methods for trace element studies previously described (E. S. R., 74, p. 616; 75, p. 462), it would appear from this work that the trace elements probably play a specific role in CO_2 utilization by *Aspergillus* just as they do in photosynthesis in green plants, and the chemical elements are almost entirely the same in both instances, as are their concentrations. The effects of Fe deficiency are also most easily demonstrated in both cases. The advantages of *A. niger* for such studies are discussed.

Boron a minor plant nutrient, W. L. POWERS. (Oreg. Expt. Sta.). (*North-west Sci.*, 16 (1942), No. 1, pp. 19-22).—A general review, with 20 references.

Comparative study of the calcium-boron metabolism of representative dicots and monocots, R. P. MARSH. (N. J. Expt. Stas.). (*Soil Sci.*, 53 (1942), No. 1, pp. 75-78).—Studying tobacco, broadbean, corn, and oats in continuous

flow sand culture, the optimum B requirement proved greater for dicots than for monocots, both grew normally only within the optimum concentration range of the tissues, and for both the presence of adequate available B within the plant tended to maintain the previously acquired Ca in an available state. Within certain limits the B content of the substrate did not significantly influence the Ca absorption rates of either dicots or monocots. The soluble Ca in the tissues of both was determined by the B content, which in turn was determined by the B content of the substrate. In comparison with B content of the dicots studied, a relatively very large proportion in the monocots was in soluble form. For both groups the proportion of soluble B was directly related to the total B in the plants and to that in the substrate.

Absorption, translocation and ultimate fate of lithium in the wheat plant. N. L. KENT (*New Phytol.*, 40 (1941), No. 4, pp. 291-298).—Studying the absorption and translocation of lithium by wheat seedlings under certain experimental conditions, "the plants were analyzed for lithium spectrographically by a modification of the Ramage flame method. During the first few days after lithium treatment, young seedlings accumulated lithium in the roots; later the lithium was accumulated principally in the oldest leaves, where high concentrations were attained. The experimental results suggest that lithium stored in the oldest leaves is immobile and cannot be translocated. In this respect lithium bears more resemblance to calcium than to the other alkali elements. When the direction of the lithium gradient between the soil and the plant was reversed (by repotting lithiated plants in untreated soil) lithium was rapidly lost from the roots to the soil, suggesting that movement of lithium into and out of the plant depends—in part at least—on the direction of the lithium gradient."

Differences in growth limitation of certain plants by magnesium and minor element deficiencies. A. L. SOMMER and A. BAXTER. (Ala. Expt. Sta.). (*Plant Physiol.*, 17 (1942), No. 1, pp. 109-115, figs. 3).—Among the crops studied, corn in the vegetative stage was least affected by deficiencies in the so-called minor elements. Turnips were severely affected by lack of minor elements, but showed symptoms of Mg deficiency only in the least productive soils. Crimson clover exhibited the effects of minor-element deficiencies somewhat less and of Mg deficiency somewhat more than did turnips. On the soils studied, cotton was about equally affected by the lack of Mg and of the minor elements. Peanuts (tops) showed symptoms of severe Mg deficiency in only one soil and of fairly marked deficiency in a few soils, but the effect of Mg on nut production was much greater. Growth of peanuts was only slightly limited by soil deficiencies in the minor elements which, after the first few weeks, prevented the growth of the preceding turnip crop.

Manganese deficiency of oats on alkaline organic soils. G. D. SHERMAN and P. M. HARMER. (Mich. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 12, pp. 1080-1092, figs. 5; *abs. in Michigan Sta. Quart. Bul.*, 24 (1942), No. 3, p. 263).—The following conclusions are drawn from this study: This physiological break-down on Mn-deficient soils is identified with the gray speck disease of Europe, Australia, etc. Its development is characterized by the "gray speck," "halo," and "dry spot" stages, the predominant one depending on climatic and soil conditions and on varietal factors. On a markedly Mn-deficient soil, oats will become chlorotic as well as gray-specked. The most practical preventive on an alkaline organic soil is said to lie in applying MnSO_4 (100-400 lb. per acre), or S in amount sufficient to give a pH somehow below 7. Gray speck can be experimentally controlled by applying to the soil any manganous salt, permanganate, S , H_2SO_4 , hydroquinone, creatinine, hemoglobin, or SnCl_4 . The evidence strongly indicated that any treatment increasing the exchangeable Mn in the

soil used to 3 p. p. m. or more will prevent development of gray speck. This can be accomplished by adding soluble Mn or by reduction of manganic Mn to the manganous form by chemical means. The amount of exchangeable Mn in the soil necessary to prevent development of gray speck will vary with different soils, depending both on their pH and on their active Ca supply.

Toxicity and accumulation of chloride and sulfate salts in plants, F. M. EATON. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 64 (1942), No. 7, pp. 357-399, figs. 9*).—When a series of crop plants were grown in outdoor sand cultures with a base medium plus chloride and sulfate salts added in milliequivalents per liter, sulfate appeared to be about half as toxic as chloride to some plants, but lemon was apparently four or more times as tolerant to sulfate. Tomatoes and beets were more tolerant to 50 milliequivalents of chloride than to 100 of sulfate. Barley, milo, and navy bean leaves were burned by chloride and sulfate salts, and lemon leaves occasionally, but alfalfa, cotton, tomato, and beet plants showed no leaf burning. The growth-depression curves exhibited no evidence of an abrupt point at which toxicity effects become pronounced, but above some minimum concentration each successive unit of salt, considered by itself, tended to produce a lesser depression in growth than the preceding unit. The succulence of crops (barley excepted) was not influenced by the salt concentration.

Analyses of the expressed tissue fluids of the six crop plants used exhibited much diversity in the proportions and amounts of ions accumulated in the sap, but the ratios of concentration of salt constituents in the nutrient solution to that in the sap of the controls were high for nearly all ions. Tenfold increases in the concentration of bases in the nutrient by adding chloride salts and fourteenfold by adding sulfate salts in no case doubled the concentration of total bases in the expressed sap. Under all treatments, cotton and tomato had several times as much S in their sap as the other plants. The pH of the sap of a number of plants was increased by chloride but not by sulfate. Conductivity appeared to have little significance as a measure of the electrolyte content of expressed tissue fluids. Increases in osmotic pressure of these fluids from salt additions tended to parallel the increases in that of the culture solutions. The data failed to support the view that plants on saline substrates are injured by the high osmotic concentrations and consequent limitations in water intake. Per unit of dry matter produced, less water was lost by transpiration and evaporation from the 50-chloride and 50-sulfate cultures than from controls, but the water requirements of the 150-chloride and 250-sulfate plants exceeded that in the controls. It is concluded that the water requirements of plants on saline soils tend to be lower than on nonsaline soils, but that this effect may be more than offset when the reduced growth causes an excessive exposure of the plants to light and wind. There was no blossom-end rot of the control tomatoes, whereas 34 percent in the 150-chloride bed and 78 percent in the 150-sulfate bed were affected. Unfavorable relations due to osmotic concentration in the solution is discounted as a probable cause, but some relation to Ca and Mg accumulation is indicated.

In greenhouse water-culture tests with mixed Ca, Mg, and Na chlorides and with mixed sulfate salts, the salt concentrations above a few milliequivalents proved injurious to corn but tomatoes showed a maximum growth with 10 of chloride and 5 of sulfate in both water and sand cultures. The growth-depression curves of both crops with either salt tended to flatten as the concentration increased, showing more toxicity per salt unit in the low concentrations. Increasing the salt concentration throughout the higher ranges reduced the water requirements and increased the weights of the roots relative to those of the whole plants. The terms "critical concentration," "limit of tolerance,"

and "threshold values," borrowed from other biological fields, are believed unsuited to plant responses to chlorides and sulfates. The limit of tolerance of any plant appears to be an intangible concept, since death occurs slowly over a range of concentrations, and on especially warm days plants growing in saline solutions may die rapidly. There are 34 references.

Isolation from *Astragalus pectinatus* of a crystalline amino acid complex containing selenium and sulfur, M. J. HORN and D. B. JONES. (U. S. D. A.). (*Jour. Biol. Chem.*, 139 (1941), No. 2, pp. 649-660, figs. 3).—Since the discovery by Robinson (E. S. R., 70, p. 295) of Se in toxic wheat from seleniferous soil, one of the most fundamental correlative problems has been to determine in what form it occurs in the grain. The present authors have isolated a compound difficultly soluble in H₂O, alcohol, and common organic solvents but readily soluble in dilute NH₄(OH) and HCl, and in which the Se is very stable. The percentage composition and a tentative structural formula are given, and it is believed that the Se in toxic wheat and other grains is combined in the protein as an amino acid of similar structure to the one presented.

Effect of external factors on tomato pigments as studied by chromatographic methods, F. W. WENT, A. L. LERSEN, and L. ZECHMEISTER (*Plant Physiol.*, 17 (1942), No. 1, pp. 91-100).—These methods, permitting detection and quantitative estimation of each individual carotenoid in a complicated mixture, were used in studying some physiological factors on tomato pigment. Whereas the carotenoid in tomato leaves is remarkably constant, that of ripe tomatoes is widely variable. This variability depends partly on unknown external or internal factors but also partly on physiological conditions in the parent plants. Under conditions favorable for fruit development, the lycopene and total carotenoid concentrations in the fruits are low, whereas poor conditions favor higher lycopene concentration. When detached tomatoes are ripened at 33° C. no lycopene is formed, although all other pigments develop normally. After a prolonged stay at 33° the mechanism of lycopene formation is still unimpaired and shows a sharp optimum near 19°. The β -carotene content of tomatoes is very little influenced by the external conditions studied.

A cytological study of the carotene in the root of *Daucus carota* under various experimental treatments, T. E. WEIER. (Univ. Calif.). (*Amer. Jour. Bot.*, 29 (1942), No. 1, pp. 35-44, figs. 11).—In this study, details of which are given, there is good evidence to support the idea that carotene in the carrot is associated with some other substance in the cell. However, it seems certain that on destruction of the cell the pigment goes into solution in cellular lipoids. Therefore, great care should be exercised in the analysis of the so-called carotene-simples. Unless correct precautions are taken the associated compounds may be those derived from the cytoplasm rather than those normally in association with the pigment.

A study of the chlorophyll, xanthophyll, and carotene contents of the wheat kernel harvested at successive stages of development, C. R. WOOD (*Sci. Agr.*, 22 (1941), No. 2, pp. 93-103, fig. 1).—Analyses of Regent wheat samples harvested at 10 ripening stages (1939) indicated a marked reduction in chlorophyll, xanthophyll, and carotene with the maturing process. This was most notable for chlorophyll, which at the fully ripe stage was present at less than 1 p. p. m. Xanthophyll still remained in the kernel to the extent of 2.5 p. p. m. and carotene to a small fraction of 1 percent. Chlorophyll determinations in 1940 also showed a marked reduction as the wheat matured. A brown colored substance interfering with the chlorophyll determination is discussed, as well as the development and use of a whole-wheat meal method which overcame this difficulty.

Accumulation of nicotine in reciprocal grafts of tomato and tobacco, R. F. DAWSON. (Univ. Mo.). (*Amer. Jour. Bot.*, 29 (1942), No. 1, pp. 66-71).—When tobacco scions were grown on tomato stocks no appreciable accumulation of nicotine occurred in the tobacco leaves or stems, that originally present remaining in the lower leaves and stem of the scion and tissues subsequently developed being nicotine-free. In the reverse graft, nicotine was found in the tomato stems, fruits, and leaves. Nicotine accumulated in the leaves of tomato shoots was sectoral when tobacco stems were decapitated and inserted into the tomato stems unilaterally. Growth, including mitosis and cell enlargement, occurred quite normally in the absence of detectable amounts of nicotine when tobacco shoots were grafted on tomato stocks. It thus appears that nicotine, in appreciable amounts at least, is not essential to the development of the aerial parts of the tobacco plant.

Relations between respiration rate and metabolism of carbohydrate, protein, and organic acids in leaves, J. G. WOOD (*Austral. Jour. Expt. Biol. and Med. Sci.*, 19 (1941), No. 4, pp. 313-321, figs. 3).—Measuring the respiratory rate of Sudan grass leaves at intervals through its life cycle in both air and N by a conductometric method, both aerobic and anaerobic respiratory rates exhibited high linear correlations with cytoplasmic protein-N, but the relation with total protein-N was more complex. It is suggested that cytoplasmic protein-N is a measure of the number of respiratory centers. The respiratory rate on a cytoplasmic basis both in air and in N showed a correlation with amino acid N, sucrose, and malic and citric acid contents. The content in the two acids was also correlated with sucrose and amino-acid contents. In air there was a greater using up of amino acids than in N. It is shown that these observations may be accounted for by a schema involving oxidation through the Krebs cycle and transamination, but the data likewise suggest an oxidative deamination of amino acids in air and also that the steady state relation between proteins and amino acids and between amides and amino acids may be determined by the respiratory tempo.

Studies in the metabolism of plant cells.—I, Accumulation of chlorides by plant cells and its relation to respiration, R. N. ROBERTSON (*Austral. Jour. Expt. Biol. and Med. Sci.*, 19 (1941), No. 4, pp. 265-278, figs. 9).—Using cut carrot tissue, the accumulation was determined by measuring the change in conductivity of the solution in contact with the tissue, and the respiration by measuring the CO₂ evolution. All five chlorides used caused an initial increase in respiratory rate. In the monovalent chlorides this high rate was maintained in time, while the salt accumulation rate decreased; in the divalent ones the respiration, though initially above the controls, fell to the value of the latter and in one case below it. The relationship of the amount of salt accumulated to the amount of extra CO₂ produced in salt respiration is discussed. With KCl the extra CO₂ produced per gram mol of salt accumulated was about the same, increasing similarly with time in all cases. The course of accumulation in time is discussed in relation to the energy requirement of the process, and it is shown that the concentration difference between the external solution and the tissue does not seem to govern the rate of the process at higher concentrations. A suggested interpretation is presented, and the relation of this work to other recent studies (21 references) on salt accumulation is discussed.

The separation of an "activity" metabolism from the total respiration of yeast by the effects of ethyl carbamate, K. C. FISHER and J. R. STERN (*Jour. Cell. and Compar. Physiol.*, 19 (1942), No. 1, pp. 109-122, figs. 5).—On testing the effect of a graded series of concentrations of ethyl carbamate on

O₂ consumption and cell multiplication in yeast, the respiratory data revealed a discontinuity in the relation between narcotic concentration and effect which is inconsistent with the view that the inhibition involves only a single respiratory system. The difficulty is completely overcome if one postulates that two (or three, depending on the preparation) discrete respiratory systems comprise the total O₂ consumption. Analysis of data from the literature (24 references) on the effect of urethane on luminous bacteria and of luminal on rat brain cortex slices suggests that the total respiration of these materials is also made up of two distinct parallel respiratory systems. The significance of the observations and their analysis is discussed in relation to the mechanism of narcosis.

The respiration of Elodea, R. R. RONKIN and S. C. BROOKS. (Univ. Calif.). (*Science*, 95 (1942), No. 2461, pp. 231-232).—Respiratory measurements, rarely performed on higher plants, indicated a very high quotient (average 8.4 in *E. canadensis*, suggesting the possible occurrence of anaerobiosis, perhaps in connection with or in addition to the utilization of chemically bound O₂. Changes in O₂ consumption were noted as the rainy season drew to a close, suggesting a relation to the dilution of pond water by rain and concentration of ions by evaporation loss. Studies of this kind should throw further light on the physiology and ecology of such aquatic plants.

Effects of oxygen on respiration, fermentation, and growth in wheat and rice, D. L. TAYLOR (*Science*, 95 (1942), No. 2457, pp. 129-130, figs. 2).—Under the experimental conditions of this preliminary study the anaerobic mechanism of rice in the absence of O₂ was about three times as active as that of wheat. It is concluded that rice is capable of germinating without O₂ because it possesses a strong fermentation mechanism, whereas wheat, with its feebly functioning anaerobic system, is unable to do so. In rice the very strongly developed anaerobic system more than compensates for an aerobic system that is even weaker than that of wheat.

Photooxidation processes in plants, J. FRANCK and C. S. FRENCH (*Jour. Gen. Physiol.*, 25 (1941), No. 2, pp. 309-324, figs. 6).—Photooxidation, measured by exposure to light in a CO₂-free atmosphere containing varying percentages of O₂, was observed in living as well as in dead leaves and in plant juices. Its rate was only slightly enhanced by feeding the leaves sugar, but the respiration (autoxidation) became considerably enlarged during exposure and the following dark period. The photooxidation rate rose slower than linearly with light intensity, and its dependence on O₂ pressure had the character of a saturation curve. The chemical kinetics of photooxidation and its influence on photosynthesis are discussed.

Radioactive carbon as an indicator of carbon dioxide utilization.—VIII, The rôle of carbon dioxide in cellular metabolism, C. B. VAN NIEL, S. RUBEN, S. F. CARSON, M. D. KAMEN, and J. W. FOSTER. (Univ. Calif.). (*Natl. Acad. Sci. Proc.*, 28 (1942), No. 1, pp. 8-15).—It is believed that general inferences which can be drawn from the considerations presented in this analytical review (*E. S. R.*, 86, p. 170) will lead to a unified concept of the role played by CO₂ in cellular metabolism. There are 44 references.

The depressant effect of carbon dioxide upon photosynthesis, L. A. T. BALLARD (*New Phytol.*, 40 (1941), No. 4, pp. 276-290, figs. 8).—High temperature coefficients for the rate of apparent assimilation were found for *Ricinus* cotyledons and *Ligustrum* leaves at 6°-16° C. CO₂ concentrations above 2-2.5 percent depressed the assimilation rate of *Ligustrum* leaves at 6°, the percentage of depression being greater at high than at low light intensities. No such depression occurred in concentrations up to 5 percent at 16°. A similar depression

at 6° occurred with *Ricinus* cotyledons, and sometimes at 16°. These data are interpreted on the basis of CO₂ itself acting as an inhibitor of the HCN type by combining with the catalyst *B* which, in the dark or chemical reaction, facilitates the break-down of a light-activated compound of CO₂ with a substance *S*. This is believed to explain the greater depression at high light intensities. To explain the more marked depression at low temperatures it is assumed that the dissociation constant of the compound of CO₂ with the substance *B* increases with rise in temperature. This also partially accounts for the high temperature coefficients observed. The different behavior of the two types of material may be explained by assuming different ratios of the substance *B* to the substance *S*.

Further studies on the effects of several spray materials on the apparent photosynthesis of the greenhouse rose, M. T. FOSSUM and A. LAURIE (Ohio Sta. Bimo. Bul. 214 (1942), pp. 42-52, figs. 3).—Continuing previous studies and methods (E. S. R., 85, p. 781), the materials used were technical mannitan monolaurate, technical mannitan monolaurate plus rotenone and other derris extracts, and a combination of trichlorophenoxy-ethylchloride, thymol, dibenzyl disulfide, phenothioxin, mannitan monolaurate, and derris resins. Spraying with the last resulted in reductions in the apparent photosynthetic rate of 10-65 percent for 8-9 days following application, its effect being very similar to that of the spray materials used in the previous study. Of the various materials tested on greenhouse roses, the monolaurate alone or combined with rotenone exhibited the least effect on CO₂ assimilation. The initial photosynthetic reduction of 10-70 percent for the first 24-48 hr. after application was the only discernible significant effect on photosynthesis.

Electrophoresis of the chlorophyll-protein complex, M. FISHMAN and L. S. MOYER. (Univ. Minn.). (Science, 95 (1942), No. 2457, pp. 128-129).—Although the protein nature of the chlorophyll complex isolated from leaves has been supported by recent analytical evidence, it seemed desirable to investigate the problem by means of electrophoresis in an attempt to demonstrate an isoelectric point in the pH range characteristic of proteins. The authors believe it premature to assert that these preliminary observations characterize the chlorophyll protein itself, but the electrophoretic properties found were closely correlated with the general colloidal behavior of the complex.

Relations between protein-nitrogen, protein-sulphur and chlorophyll in leaves of Sudan grass, E. A. HANSON, B. S. BARRIEN, and J. G. WOOD (Austral. Jour. Expt. Biol. and Med. Sci., 19 (1941), No. 3, pp. 231-234, fig. 1).—Total protein-N, total protein-S, chlorophyll, chloroplast protein-N, and chloroplast protein-S in *Andropogon sudanensis* attained a coincident maximum during the life cycle and thereafter decreased. In young leaves chloroplast protein comprised about 7 percent of the total protein, but later 35-40 percent of the total was localized in the chloroplast. The chloroplast proteins were rich in S and contained about 70 percent of the total protein-S. The ratio chloroplast protein-N/chloroplast protein-S remained approximately constant during the life cycle, but the ratio total protein-N/total protein-S decreased, indicating greater using up of cytoplasmic proteins during senescence. In young leaves chloroplasts were relatively high in chlorophyll but low in protein. Later there was a marked increase in chloroplast protein, but thereafter both chlorophyll and protein decreased. During senescence chlorophyll disappeared from the leaves more rapidly than protein. Assuming a molecular weight of 68,000 for protein, about 20 chlorophyll molecules are associated with each protein molecule in the chloroplast over the greater part of the plant's life cycle.

Some effects of photoperiod on leaf growth, I. H. STUCKEY. (R. I. Expt. Sta.). (Amer. Jour. Bot., 29 (1942), No. 1, pp. 92-97, figs. 2).—Orchard grass

(*Dactylis glomerata*) seedlings grown in 8- and 16-hr. photoperiods differed much in size and plant habit, those under the longer day being characterized by longer leaves and more erect habit. These differences were correlated with the following: Lengths of the vessel elements, of the fibers, and of the epidermal cells varied directly with total organ size, indicating that leaf-length differences were due to cell size rather than number, at least with respect to cell types. Size of mesophyll cells remained the same, hence the differences in this tissue may be due either to differences in cell number or in size of intercellular spaces. Fiber walls were noticeably thicker in long-day plants, probably correlated with their more upright habit, but no such difference was noted in walls of the vessel elements.

Relation of length of photoperiod and intensity of supplemental light to the production of flowers and berries in the greenhouse by several varieties of potatoes, H. O. WERNER. (Nehr. Expt. Sta.) (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 5, pp. 257-274, figs. 7).—Four varieties were grown in the greenhouse under three light intensities and three types of photoperiods to determine the best combination for producing seed in midwinter for breeding. Most extensive blossom, berry, and seed production followed a 24-hr. photoperiod [no dark period] accomplished by supplemental light intensity of about 500 foot-candles at the tops of the plants. As supplemental light or photoperiod was decreased, blossom and berry production became much less extensive. The shortest photoperiods and lowest light intensity proved very unsatisfactory for the "shy" blooming variety Triumph and only fairly suitable for those blooming most readily, such as Katahdin. Best vegetative growth occurred with the weakest light and 24-hr. photoperiod.

Tragopogon dubius: Its response to length of day, H. A. ALLARD. (U. S. D. A.). (*Ecology*, 23 (1942), No. 1, pp. 53-58, figs. 2).—From the data presented and detailed, it would appear that the behavior and branching growth form of *T. dubius* depend closely on a favorable length of day. Since *T. dubius* and *T. porrifolius* (garden salsify) show similar field behaviors and grow side by side in the wild state, it is deemed probable that the latter will show similar length-of-day responses. These data may thus have some significance in interpreting the behavior of the commercially more important species.

Increased ultra-violet absorption of cells following irradiation with ultraviolet light, J. R. LOOFBOUROW and L. JOYCE (*Nature [London]*, 148 (1941), No. 3745, p. 166, fig. 1).—By direct observation and photomicrographic methods, using *Saccharomyces cerevisiae*, a progressive increase in the ultraviolet absorption of the cells during irradiation was noted. Since the wavelengths employed were in the range highly absorbed by purines and pyrimidines, the results could be interpreted as indicating a production by the injured cells of nucleic acidlike materials. These findings are briefly discussed in their bearing on the radiosensitivity of neoplasms.

Structure of cellulose as revealed by optical and X-ray methods, W. J. LYONS. (U. S. D. A.). (*Sci. Mo.*, 54 (1942), No. 3, pp. 238-246, figs. 13).—This is a general discussion of optical studies, crystal analysis by X-rays, and X-ray studies of cellulose fibers, with bibliographic footnotes.

Carlologia de algunas especies del genero Paspalum [Kariology of some species of the genus Paspalum], F. SAURA (*Buenos Aires Univ., Inst. Genét. [Pub.]*, 2 (1941), No. 3, pp. [2]+41-48, pls. 3).—As a result of the study reported, this grass genus is separated into diploid, tetraploid, hexaploid, and octoploid groups. The acetocarmine method was used on pollen mother cells arising from inflorescences taken immediately before the flowering stage. The average diameters of the microsporocytes and their corresponding standard deviation

were determined, and differences observed among the species and their relations with chromosome number are discussed.

Comparative rates of division in large and small cells of developing fruits. E. W. SINNOTT (*Natl. Acad. Sci. Proc.*, 28 (1942), No. 2, pp. 36-38).—In the 12 inbred lines of cucurbits in 4 genera studied, the rate of cell division seemed to be determined by some factor independent of cell size and operative throughout the whole organism.

The development and distribution of the endodermis and an associated oxidase system in monocotyledonous plants. D. S. VAN FLEET (*Amer. Jour. Bot.*, 29 (1942), No. 1, pp. 1-15, figs. 19).—Studying the roots of several species and varieties of *Allium*, the rate and ultimate extent of the development of the endodermis were found to be governed, in part at least, by certain sets of environmental factors and particularly as they affect an oxidase system associated with the endodermis in its development. Details are presented.

Origin of the suberized semipermeable membrane in the caryopsis of maize. H. JOHANN. (U. S. D. A. coop. Wis. Expt. Sta.) (*Jour. Agr. Res.* [U. S.], 64 (1942), No. 5, pp. 275-282, pls. 7).—This study indicated that corn conforms to the general pattern of the grass family in which the suberized semipermeable membrane or membranes within the caryopsis are derived from one or both integuments. Using Sudan III or Sudan IV the presence of thin layers of suberin on the surface of both the inner integument and the epidermis of the nucellus was shown, the primary membrane being formed on the inner surface of the inner integument. Early in the development of the caryopsis the two membranes become physically united, thereafter appearing to be a single membrane common to both surfaces. In some strains, areas on the outer surface of the inner integument also become lightly suberized, but no suberization of the outer integument was observed.

Structural features of the shoot apices of diploid and colchicine-induced, tetraploid strains of *Vinca rosea* L. G. L. CROSS and T. J. JOHNSON (*Bul. Torrey Bot. Club*, 68 (1941), No. 9, pp. 618-635, figs. 24).—The shoot apex of *V. rosea* is compared with that of *V. minor*, and the results of the colchicine treatments are described in great detail. It is emphasized that colchicine affects the shape, as well as the size and chromosomal number, of the cells in the apical meristem of *V. rosea*, and the visible changes in the meristem following treatment are correlated with changes in the form of the adult plant.

Progress in the standardization of stains: Co-operation among the Americas. H. J. CONN (*Stain Technol.*, 17 (1942), No. 1, pp. 5-6).

Some notes concerning plant photography. E. B. MAINS (*Jour. Biol. Photog. Assoc.*, 10 (1941), No. 1, pp. 2-7, figs. 6).

A method for the study of the root system of plants. L. A. GÓMEZ. (P. R. Univ. Expt. Sta.). (*Rev. Agr., Indus. y Com., Puerto Rico*, 33 (1941), No. 4, pp. 609-610).—Previously published methods are reviewed and details are given of the author's method, which involves mapping out the soil surface into 1-foot-square blocks and excavating in cubic blocks to a depth where no more roots are found. A record of the number and location of each cubic block is kept. The roots in each block are finally taken out by hand over a ¼-inch-mesh screen, bagged, and labeled. They are then washed, oven-dried, weighed, and located on the map, so that their distribution in the soil, foot by foot at different soil levels, can be determined.

Quantitative correlations between vegetational changes and soil development. W. D. BILLINGS. (Univ. Nev.). (*Ecology*, 22 (1941), No. 4, pp. 448-456, figs. 2).—"The use of statistical methods in successional research will necessitate careful experimental design and more replication of experimental work.

Care must be exercised to see that only properly paired data are used in correlation to avoid confounding the effects of the various factors under consideration. Free-hand regression curves or lines should be avoided in exact work, when possible, since they are subjective and can be misleading; quantitative research should be truly quantitative. Statistics, however, cannot replace clear thinking, and masses of figures should not be allowed to obscure a clear picture of the problem. . . . More exact methods will continue to come into use. Meanwhile, the careful and systematic use of sound quantitative procedure will aid greatly in the solution of complex problems such as those involved in the understanding of vegetational and soil development." There are 18 references.

GENETICS

Genetics in the U. S. S. R., P. G. 'ESPINASSE (*Nature* [London], 148 (1941), No. 3764, pp. 739-743).—The views, theories, and concepts of genetics proposed by N. I. Vavilov and T. D. Lyssenko at a conference held on genetics and selection in 1939 in the U. S. S. R. are presented and discussed.

Genes and genesis, H. W. CLARK (*Mountain View, Calif.: Pacific Press Pub. Assoc.*, [1940], pp. 155, [fig. 1]).—A popular presentation of genetics and evolution in the light of religion.

[Crop plant genetics] (*Genetics*, 27 (1942), No. 1, pp. 129-130, 131, 134-135, 137, 154, 163, 166, 167).—Papers presented at the 1941 meetings of the Genetics Society of America at Cold Spring Harbor, N. Y., and Dallas, Tex., (and abstracted in the above paging) included The Action of the Gene Dwarf₁ in the Ontogeny of the Stem in Maize, by E. C. Abbe and B. O. Phinney (p. 129) (Univ. Minn.); The Multiple Oppositional Alleles Causing Cross-Incompatibility in *Trifolium repens*, by S. S. Atwood (pp. 129-130) (U. S. D. A.); Asynaptic Plants of *Gossypium* and Their Polyploids, by J. O. Beasley and M. S. Brown (p. 131) (Tex. Expt. Sta.); Somatoplastic Sterility as a Function of the Endosperm Genotype, by R. A. Brink and D. C. Cooper (p. 134) (Univ. Wis.); The Nature and Extent of Variation in Kentucky Bluegrass as Criteria for Apomictic Seed Formation, by W. H. Brittingham (pp. 134-135) (U. S. D. A. and Univ. Md.); Preliminary Investigations in *Zea mays* of the Germination Capacity of Pollen With Aberrant Nuclei, by F. J. Clark (p. 137) (Conn. [New Haven] Sta.); Inheritance of Seed Longevity in Maize Inbreds and Hybrids, by E. W. Lindstrom (p. 154) (Iowa State Col.); The Influence of Heterozygosis on Fertility and Vigor in Autotetraploid Maize, by L. F. Randolph (p. 163) (U. S. D. A. and Cornell Univ.); The Effects of Translocations on Growth in *Zea mays*, by L. M. Roberts (p. 166) (Conn. [New Haven] Sta. et al.); and Translocations Involving "B" Chromosomes in Maize, by H. Roman (p. 167) (Univ. Mo.).

Genetic effects of ultraviolet radiation in maize.—IV, Comparison of monochromatic radiations, L. J. STADLER and F. M. UBER. (U. S. D. A. and Mo. Expt. Sta.). (*Genetics*, 27 (1942), No. 1, pp. 84-118, figs. 6).—Observations made in the fourth of this series (*E. S. R.*, 77, p. 31) may be summarized as follows:

Results of comparisons of effectiveness of different wavelengths differ rather widely in trials made at different levels of dosage, the problem of comparing wavelength effectiveness being chiefly that of analyzing the dosage relation. In general, the dosage curve for ultraviolet radiation tends to level at the larger doses. The return from large doses is proportionately less than from small. This tendency is more pronounced at $\lambda 2536$ and $\lambda 2652$ than at $\lambda 2967$ and $\lambda 3022$. The disproportionately small return from an increment of dose may be

avoided if the increment is applied from the opposite side of the pollen grain, indicating that variations in susceptibility of pollen grains treated are related to their orientation. The gametic nuclei within pollen grains are eccentrically located, so that in a layer of pollen grains oriented at random there are large differences in the depth of the nuclei below the irradiated surface. The absorption of ultraviolet radiation in the pollen wall and contents is great enough to cause large differences in intensity of the radiation penetrating to the nucleus site in different pollen grains. Transmission losses are greatest for the shorter wavelengths, at which leveling of the dosage curve is most pronounced. Using observed values for the position of nuclei within the pollen grain and for transmission losses in pollen wall and contents, and assuming that effectiveness of each wavelength per unit of energy is constant, the form of dosage curve expected at each wavelength may be determined. The amount of leveling in calculated dosage curves was in fairly good agreement with that observed. The value of a constant representing the effectiveness per unit of energy reaching the nucleus was determined for each of nine wavelengths in the range $\lambda 2378$ – $\lambda 3022$ from data representing effects of doses of 2,000 e. per square millimeter of energy incident at the surface of the pollen grain. These values agreed within limits of sampling error with the relative absorption coefficients of nucleic acid for the same wavelengths.

Chromosome pairing and fertility in hybrids and amphidiploids in the Triticinae, E. R. SEARS. (Coop. U. S. D. A.). (*Missouri Sta. Res. Bul.* 337 (1941), pp. 20, fig. 1).—The 24 different hybrids involving 10 different species of *Triticum*, *Aegilops*, and *Haynaldia* with $n=7$ varied in chromosome pairing from an average frequency of from 12.66 to 0.32 univalents per microsporocyte. Amphidiploids obtained from 18 of these hybrids varied in fertility from nearly perfect to almost 0. There was no consistent relationship between $4n$ fertility and lack of $2n$ pairing, attributable chiefly to the following factors: Data on chromosome pairing in the $2n$ hybrids did not always accurately measure homologies responsible for multivalent formation in the amphidiploids, mainly because some hybrids did not show all the pairing of which they were capable. Meiotic disturbances other than those due to multivalent homologies increased the frequency of univalents in certain amphidiploids and thereby reduced fertility, e. g., in *A. umbellulata* \times *H. villosa*. Certain amphidiploids were relatively fertile in spite of high frequencies of multivalents. Fertility, particularly seed set, of some amphidiploids was affected adversely by environmental conditions. Of a total of 144 offspring of amphidiploid plants from all crosses, 111 were of regular chromosome constitution.

Amphidiploids in the seven-chromosome Triticinae, E. R. SEARS. (Coop. U. S. D. A.). (*Missouri Sta. Res. Bul.* 336 (1941), pp. 46, figs. 19).—High incidence of tetraploidy, accompanied by relatively little killing, followed the use of 2.0 percent of colchicine (E. S. R., 81, p. 191) in lanolin on coleoptiles of germinating seeds or the repeated application of 0.5 percent aqueous colchicine solution to crowns of potted plants. The latter method appeared to be better adapted to hybrid material, since plants may be propagated vegetatively before treatment. The 19 hybrids giving rise to amphidiploids involved species of *Triticum*, *Aegilops*, and *Haynaldia* with $n=7$ and included 7 intergeneric crosses. In none were the $4n$ sectors distinguishable other than by fertility and, in some instances, by larger stomatal size. Differences had not appeared in the 18 amphidiploids carried one or more generations further. The amphidiploids were generally intermediate to their parent species in the various morphological characters studied. The only consistent exception, unsplit palea, was always dominant. Some amphidiploids exceeded both parents in time of maturity,

length of rachis segments, and size of seeds. These increases, particularly in time of maturity, might be manifestations of hybrid vigor. Increase in seed size probably to some extent may be an effect of chromosome doubling.

Somatic chromosome complements in *Bouteloua*, J. L. FULTS. (Univ. Nebr.). (*Amer. Jour. Bot.*, 29 (1942), No. 1, pp. 45-55, figs. 66).—The somatic chromosome complements in this grass genus were investigated in 18 biotypes of 7 species, 114 plants from 85 seed sources being included. Chromosome numbers varied from $2n=21$ to $2n=98$. There are 22 references.

Melotic chromosome behavior in species, species hybrids, haploids, and induced polyploids of *Gossypium*, J. O. BEASLEY. (Tex. Expt. Sta.). (*Genetics*, 27 (1942), No. 1, pp. 25-54, pl. 1, figs. 6).—The melotic chromosome behavior is regular in 13-chromosome species of *Gossypium*, but a few irregularities occur in 26-chromosome species. In meiosis of autopolyploids about two-thirds of the chromosomes form quadrivalents. In a haploid of a 26-chromosome species a maximum of five pairs of chromosomes was found. In hybrids between species, amount of chromosome pairing varies from complete to almost none. In hybrids with a reduced amount of pairing there was evidence that structural differences existed among some of the chromosomes, and in some species hybrids apparently all the chromosomes were structurally dissimilar. Most chromosomes formed bivalents in polyploids that were produced from hybrids with a reduced amount of chromosome pairing. Usually, however, cells in first metaphase and anaphase had one or more anomalies. The tetraploid species of *Gossypium* have one set of chromosomes similar to the set in Asiatic 13-chromosome species and the other set like that in American 13-chromosome species. The species of *Gossypium* are separated into six general types chiefly on the basis of chromosome pairing, structure (arrangement of genes), and chromosome number. The degree of relationship of the types is discussed. Structural changes in the chromosomes probably had little importance in the initial speciation of *Gossypium*.

[Genetics studies with tomatoes and sweet corn] (Iowa Sta. Rpt. 1941, pts. 1, pp. 173-175, fig. 1; 2, p. 40).—Part 1 of the report deals with polyploidy in tomatoes, by E. W. Lindstrom; part 2, with sweet corn breeding, by E. S. Haber.

[Abstracts of papers on fungus genetics] (Genetics, 27 (1942), No. 1, pp. 130-131, 154).—Of interest to agricultural botany are Genetics of Biochemical Characters in *Neurospora*, by G. W. Beadle and E. L. Tatum, and X-ray and Ultraviolet Induced Mutations in *Neurospora*, by C. C. and G. Lindegren.

Virus genes, H. H. MCKINNEY (7. Internatl. Genet. Cong., Edinburgh, 1939, Proc., pp. 200-203).—A review with 21 references.

[Experiments on livestock breeding and artificial insemination] (Jour. Anim. Sci., 1 (1942), No. 1, pp. 57-60, 62-63, 66-67, 68-70, 78-81, 87-90).—Results are abstracted of the following investigations presented before the 1941 annual meeting of The American Society of Animal Production:

The Application of Genetic Principles to Animal Breeding Problems, by P. W. Gregory (p. 57) (Univ. Calif.); The Effect of Environmental Variations on Growth of Navajo Lambs, by C. T. Blunn (pp. 57-58) (U. S. D. A.); Evaluation of Fleece Yield in the Improvement of Navajo Sheep, by J. O. Grandstaff (pp. 58-59) (U. S. D. A.); Seasonal Influences on the Reproductive Performance of Mares and Jennets in Mississippi, by V. R. Berliner (pp. 62-63) (Miss. State Col.); Twinning in Horses, by L. H. Blakeslee, R. S. Hudson, and H. Hunt (p. 63) (Mich. State Col.); The Influence of Inbreeding on Birth Weight, Rate of Growth, and Type of Dairy Cattle, by J. W. Bartlett, R. P. Reece, and O. L. Lepard (pp. 66-67) (N. J. Expt. Stas.); Organization and Development of the Regional Swine Breed-

ing Laboratory, by W. A. Craft (pp. 68-69) (U. S. D. A.); A Study of Certain Trends in Inbred Lines of Swine, by M. L. Baker and C. F. Reimiller (p. 69) (Nebr. Sta.); Constructing Selection Indexes to Make Maximum Progress, by L. N. Hazel and J. L. Lush (pp. 69-70) (Iowa State Col.); Heritability of Differences in 180-Day Weight and Market Score of Duroc Swine, by J. A. Whatley, Jr., and R. H. Nelson (p. 70) (Okla. Sta.); A Study of Estrus and Ovulation in the Mare, by J. N. Cummings (p. 78) (Mont. State Col.); Staining Affinity of Bovine Spermatozoa, by R. G. Fosslund and G. K. L. Underbjerg (pp. 78-79) (Univ. Nebr.); A Preliminary Report on the Effect of the Ration on the Semen Production of Young Dairy Bulls, by H. A. Lardy, P. H. Phillips, and I. W. Rupel (p. 79) (Univ. Wis.); Some Factors Influencing the Resistance of Bull Sperm to Unfavorable Environmental Conditions, by J. F. Lasley, G. T. Easley, and R. Bogart (p. 79) (Univ. Mo. coop. U. S. D. A.); Fertility in Sheep at High Altitudes in Peru, by F. F. McKenzie (pp. 79-80) (Utah State Agr. Col.); Effect of Diluters and Storage Upon Fecundity of Bovine Semen, by G. K. L. Underbjerg, H. P. Davis, and R. E. Spangler (p. 80) (Univ. Nebr.); A Comparison of First and Second Semen Collections From Dairy Bulls, by E. J. Weatherby, R. P. Reece, and J. W. Bartlett (pp. 80-81) (N. J. Stas.); The Inheritance of Dwarfism in Sheep, by R. Bogart and A. J. Dyer (p. 87) (Univ. Mo.); Concerning the Fate of Experimentally Produced Multiple Pregnancies in Sheep, by L. E. Casida and E. J. Warwick (p. 87) (Univ. Wis.); Genetic Resistance to Brucellosis in Swine, by H. S. Cameron, P. W. Gregory, and E. H. Hughes (pp. 87-88) (Univ. Calif.); Identical Twin Calves Maintained Under Similar Environmental Conditions, by A. B. Chapman and L. E. Casida (p. 88) (Univ. Wis.); Experimental Design for Testing Inbred Lines of Swine, by G. E. Dickerson (pp. 88-89) (U. S. D. A.); The Effect of Sex on the Development of the Pig—II, Studies of Sex Hormone Differences Between Lines, by W. W. Green, J. R. Rash, Jr., and D. L. Dailey (p. 89) (Univ. Minn.) (see p. 210); Concerning Factors Involved in Experimental Initiation and Maintenance of Pregnancy in the Juvenile Female [Rabbit], by R. L. Murphree, E. J. Warwick, and L. E. Casida (p. 89) (Univ. Wis.); and Sexual Development in Large and Small Type Poland China Hogs, by R. W. Phillips and J. H. Zeller (pp. 89-90) (U. S. D. A.).

[Animal genetic and breeding investigations by the Iowa Station] (*Iowa Sta. Rpt. 1941, pt. 1, pp. 94-96, 97-98, 102-103, 109, 113, 170-172, figs. 2*).—Progress and findings on work by J. L. Lush, C. Y. Cannon, E. N. Hansen, P. S. Shearer, C. C. Culbertson, M. D. Helser, F. J. Beard, A. L. Anderson, E. L. Quailfe, J. A. Schulz, A. J. G. Maw, E. W. Lindstrom, J. W. Gowen, and C. D. Lee are briefly presented for projects on consequences of inbreeding in Holstein-Friesian cattle and Poland China hogs; comparative amount and kind of inbreeding and other breeding practices which have been used in producing pure breeds of livestock; the value of the Danish Landrace breed in the development of improved strains of swine for American conditions; differences between various crosses of swine on Iowa farms; evaluation of swine breeding stock by determining growth, gain, ability to utilize feed, and carcass quality of the offspring; effect of inbreeding and crossbreeding in the domestic fowl; homozygosis of poultry inbred lines and its effect on resistance to fowl leucosis; and breeding for resistance to fowl typhoid and typhoidlike diseases in poultry and laboratory animals.

The suitability of the white highlands of Kenya for grade cattle of European breeds, R. DAUBNEY (*East African Agr. Jour.*, 7 (1942), No. 3, pp. 127-141, figs. 3).—Such degeneration of livestock as has been observed in Kenya is largely referable to deficiencies in nutrition. The climate or temperature from 65° to 70° F. per se does not seem responsible for fluctuations in temperature or respiration rates of the animals.

Performance of ewes bred first as lambs compared with ewes bred first as yearlings. D. A. SPENCER, R. G. SCHOTT, R. W. PHILLIPS, and B. AUNE (U. S. D. A. coop. S. Dak. Expt. Sta.). (*Jour. Anim. Sci.*, 1 (1942), No. 1, pp. 27-33).—Breeding of 119 Hampshire ewes first as lambs at 9-10 mo. of age resulted in 70.6 percent conceiving with the production of 89 lambs. During 5 yr. this group weaned 305 lambs with an average weight of 67 lb. When 84 other comparable lambs were paired with the ewes bred as lambs and first bred at 18-19 mo. of age, in 5 yr. they produced 255 lambs with an average weaning weight of 70.1 lb. The average wool production of the ewes bred as lambs and their weights were slightly retarded, but by the third year they were equal to those bred as yearlings. As compared with the ewe lambs bred but not conceiving, those which produced lambs tended to be the larger individuals. It thus is evident that breeding at younger ages materially increased total lamb production with only a slight decrease in wool production.

The concentration and metabolism of sugar in ram semen. B. H. MOORE and D. T. MAYER (*Missouri Sta. Res. Bul.* 338 (1941), pp. 35, figs. 13).—The sugar concentration of the semen of seven rams of three breeds was found to vary widely, but in the semen of a ram selected for special study because of superior libido the sugar concentration of the second ejaculate was always higher than that of the first. After vasectomy the semen proved to be a clear nonviscous fluid with the volume reduced to less than half but the sugar concentration more than doubled. Before vasectomy eight ejaculates averaged 570.9 mg. of sugar per 100 cc., but after vasectomy the mean sugar concentration averaged 1,438.1 mg. per 100 cc. Study of the volume of the cells and number of cells present led to the conclusion that 15-25 percent of ram semen consists of sperm. It seemed evident that sperm in the epididymis were suspended in a volume of fluid somewhat greater than their own. During the process of ejaculation there was added an equal volume of fluid with a high sugar content. Glycolysis studies showed that evidently there is a lack of glycolytic activity at 0° C., suggesting this as the most favorable temperature for the storage of ram semen. Temperature seemed to influence both motility of the sperm and rate of glycolysis. Some substance other than sugar furnished the energy for spermatozoa in a 30-hr. period.

Length of life and interval between generations in the Large White breed of pigs. H. P. DONALD (*Empire Jour. Expt. Agr.*, 9 (1941), No. 36, pp. 236-247, figs. 4).—A statistical investigation of the history of this breed based on the production of a random selection of 1,171 sows producing 1 litter or more suggests that an average of only about 3 litters per sow are produced. Sufficient attention does not seem to be given in the practical selection to lifetime production, mothering qualities, and bacon produced by the stock for selection of parents for breeding purposes.

The effect of sex on the development of the pig.—I, Differences in growth between boars and barrows by lines of breeding. L. M. WINTERS, R. E. COMSTOCK, D. F. JORDAN, and O. M. KISER (Minn. Expt. Sta. coop. U. S. D. A.). (*Jour. Anim. Sci.*, 1 (1942), No. 1, pp. 41-47).—Measurements of boar and barrow pairs at 4-week intervals from weaning to 24 weeks of age from six Poland China lines and one inbred station line showed differences in the way the barrows and boars grew. Boars were generally heavier and measurements of length, width, and height were greater than in the barrows, but in the inbred line barrows were generally larger than boars at the more advanced ages. In the initial selections boars left entire were generally slightly larger and heavier than barrows of the 86 boar-barrow pairs. At 20 and 24 weeks of age the barrows of the inbred station line were larger than boars both in measurements

and weight. It appears that the testes first accelerate increased weight, but at puberty there was some other factor which had a depressing effect. Selection of boars by barrow standards is questioned.

The genetic and endocrinic basis for differences in form and behavior, C. R. STOCKARD (*Philadelphia: Wistar Inst. Anat. and Biol., 1941, pp. XX+775, figs. 128, pls. [114]*).—The results of the author's studies of the influence of heredity and endocrines on the expression of different types, particularly in the dog, were assembled after his death by a committee consisting of Drs. A. Gregg, H. S. Gasser, J. C. Hinsey, A. L. Johnson, O. D. Anderson, W. T. James, J. F. Nonidez, and W. S. Ladd. The genetics of form differences in the several breeds are discussed and characteristics of the hybrids between them described. Separate portions of the book deal with contrasted patterns, head types, and skull indexes, with genetic and endocrine abnormalities in breeds and hybrids, by Stockard and Johnson; genetic constitution and endocrine abnormalities, by Stockard; variations in the histology of the endocrine glands, by Stockard and E. M. Vicari; morphologic form and its relation to behavior, by James; and the role of the glands of internal secretion in the production of behavioral types in the dog, by Anderson.

Genetics of the fowl.—XV, Multiple spurs, a mutation linked with duplex comb, F. B. HURT. (Cornell Univ.). (*Jour. Hered., 32 (1941), No. 10, pp. 356-364, figs. 5*).—A further study in this series (E. S. R., 87, p. 49) showed multiple spurs, characteristic of Black Sumatra fowls, to behave as a single dominant to the normal single spur. This conclusion was derived from the production of all multiple-spur F's from crossing a Black Sumatra ♂ with Single-Comb White Leghorn ♀s. There were 750 backcross progeny with multiple spurs to 792 with single spurs. In the F₂ there were 79 with multiple spurs to 37 with single spurs. The gene *M* causes from 3 to 5 spurs on each shank and is characteristic only of the Black Sumatra fowl. In selected matings in 1941 of 1 Single-Comb Ancona normal ♂ mated with 4 F₁ ♀s there were produced equal numbers of multiple and normal-spurred progeny, whereas the mating of another normal ♂ to the same ♀s produced 30 with multiple spurs to 81 with single spurs. This departure is interpreted that 1 normal ♂ contributed something, presumably modifying genes, that suppressed multiple spurs in 49 percent of his *Mm* progeny. Linkage tests of this gene showed it to be autosomal and in the sixth chromosome group with duplex comb (E. S. R., 83, p. 609). In about 11 percent of the heterozygous birds for duplex comb, the manifestation of *D* was suppressed independently of suppression of *M*. The amount of crossing over between these two genes in 858 gametes in coupling and repulsion phases was 27.8 percent.

An improved inexpensive individual egg record, P. D. STURKIE (Ala. Expt. Sta.). (*Poultry Sci., 21 (1942), No. 2, pp. 128-129, figs. 3*).—An individual egg record on cards, which may be removed for permanent reference without copying, is described.

A case of viable twin chicks, A. NALBANDOV. (Univ. Ill.). (*Jour. Hered., 33 (1942), No. 2, pp. 53-54, fig. 1*).—There are noted and briefly described two chicks smaller than normal, presumably of monozygotic origin and hatched from a single yolked egg.

A study of the early effects of androgenic substances in the rat by the aid of colchicine, E. Z. BURKHART (*Jour. Expt. Zool., 89 (1942), No. 1, pp. 135-165, pls. 2, figs. 3*).—A comparative study of the effects of three synthetic hormones—testosterone propionate, oestradiol benzoate in oil, and crystalline progesterone—on the stimulation of mitosis in the accessory sex glands arrested by colchicine showed this method to provide a sensitive test for androgens.

By the use of over 500 ♂ rats castrated at 40 days of age, it was found that a slight hypertrophy of the glands begins at about 23 hr. after 0.1 mg. of testosterone is injected and reaches its height at 43 hr. It starts to decline at about 67 hr. and resembles the castrate condition at 107 hr. after injection of the hormones. Increasing the dosage of testosterone to 0.3 mg. shortened the latent period but did not increase the intensity. With smaller doses, as low as 0.006 mg., responses were variable and the seminal vesicles were hardly affected. Although the strength of the dilution may play a role in seminal vesicle response, evidence indicated that the ventral prostate had a lower threshold of response than the seminal vesicle. Mitosis was delayed in the ventral prostate but not in the seminal vesicles of animals castrated 10 and 20 days before treatment. Mitotic activity and growth were evident in the seminal vesicle but not in the ventral prostate 55 hr. after treatment with 100 rat units of oestradiol benzoate. Hypertrophy was caused by two daily doses of 40 mg. of progesterone 55 hr. after the first injection.

The blood chemistry during the estral cycle in the bovine, D. F. EVELETH, T. W. MILLEN, and S. H. McNUTT. (Iowa State Col.). (*Cornell Vet.*, 31 (1941), No. 4, pp. 331-338).—Variations in the serum calcium, phosphorus, magnesium, and glucose of four virgin helpers, three lactating cows with pasture at different stages of the reproductive cycle, and of a bull were observed. Samples were taken from a cow and a bull before and after breeding and after ovariectomy of two cows.

FIELD CROPS

[Field crops research in Delaware]. (Partly coop. U. S. D. A. et al.). (*Delaware Sta. Bul.* 235 (1941), pp. 10-12).—Brief reports are made by C. E. Phillips, G. L. Schuster, A. E. Tomhave, J. M. Watkins, and H. C. Harris on fertilizer experiments with wheat and sweetpotatoes; nutrient absorption by sweetpotatoes as affected by fertilizer placement; effects of B on soybeans, peas, and lima beans; yield tests of corn hybrids and varieties; trials of barley, clover, and yellow-seeded soybean varieties and selections; breeding work with wheat; selection and improvement of white, red, and crimson clovers and Korean lespedeza; and effect of clipping on seed production in white clover.

[Farm crops research in Iowa]. (Partly coop. U. S. D. A. and N. Dak. and Minn. Expt. Stas.). (*Iowa Sta. Rpt.* 1941, pt. 1, pp. 58-73, 73-79, 127-129, 201, 202-203, 204-205, 208, 236, 237, 238, 240-241, figs. 2).—Brief progress reports (E. S. R., 85, p. 182) are made by L. C. Burnett, I. J. Johnson, C. P. Wilsie, H. D. Hughes, M. G. Weiss, C. Y. Cannon, J. L. Robinson, H. C. Murphy, C. S. Reddy, W. H. Pierre, H. R. Meldrum, C. C. Culbertson, J. J. Wallace, J. N. Martin, M. Heath, B. B. Sproat, I. E. Melhus, E. L. Waldee, A. L. Bakke, W. E. Loomis, G. Semenluk, A. T. Erwin, P. A. Minges, G. W. Snedecor, G. M. Cox, W. G. Cochran, C. Winsor, M. B. Russell, J. M. Aikman, R. E. Buchanan, and E. C. Volz from breeding work with oats, barley, wheat, soybeans, sweetclover, red clover, brome-grass, potatoes, and sweetpotatoes; interspecific hybridization in *Melilotus*; differences in efficiency of iron utilization by soybeans, conditioned by a single gene; variety tests with oats, wheat, barley, flax, red clover strains, alfalfa on bacterial wilt-infested soil, sweetclover, lespedeza, soybeans, potatoes, sweetpotatoes, and miscellaneous grasses and legumes; adaptation studies with Mukden and Kanro soybeans; measurements of the length of corolla tubes, observations on seed setting, and hybridization of red clover strains; effect of cutting medium and mammoth red clovers at different stages of maturity; a companion or nurse crop experiment with red clover; alfalfa alone as compared with alfalfa-grass mixtures; effect of selfing on seed setting in brome-grass; studies of strains of Canada

wildrye (*Elymus canadensis*); fertilizer and varietal factors affecting storage quality and fertilizer, rate, time, placement, and source experiments, and sprinkler irrigation tests with sweetpotatoes; rate of planting experiments with sugar beets and study of factors influencing sugar percentage in sugar beets during the harvest period, with emphasis on effects of a heavy rain; rate of seeding and crop sequence studies with flax; permanent pasture improvement, including determination of the relative carrying capacity of Kentucky bluegrass pasture as affected by grazing management, effect of reseeding and different soil treatments on carrying capacity and on vegetative cover, weeds, adaptation, productivity, and palatability of promising grasses used in pastures in southern Iowa on soils at different levels of productivity; differential response of soybean varieties to rate and date of planting; properties and herbicidal action of sodium chlorate mixtures; the germination of grass and clover seed; and statistical investigations of experiment station data, including lattice and triple lattice experiments in corn varietal tests.

[Agronomic research in Maine]. (Partly coop. U. S. D. A.). (*Maine Sta. Bul.* 405 (1941), pp. 430-431, 458-459, 471-482, 504-509, 525-529, fig. 1).—Field crops experiments (E. S. R., 85, p. 609) by J. A. Chucks, A. Hawkins, R. M. Bailey, D. S. Fink, J. L. Harrington, B. E. Brown, G. W. Simpson, R. Bonde, F. Upton, W. F. Porter, and D. H. Perrin, reported on briefly, included variety-spacing experiments, green manure tests, effect of date of plowing under crimson clover previous fall on yield of potatoes the next year, fertilizer trials, including different formulas, placement, variations in K content and carriers, effects of starter solutions on yields, rate of plant food absorption by different varieties, increasing seed stocks on an isolated farm, and roguing service for producers of foundation seed, all with potatoes; time of planting tests with oats, wheat, and barley; and variety tests with alfalfa, soybeans, and corn and hybrids. A paper on Grass Farming (pp. 525-529), by Fink, is included.

[Farm crops research in Mississippi] (*Miss. Farm Res. [Mississippi Sta.]* 5 (1942), No. 3, pp. 1-3, 8).—Progress results from agronomic experiments are given in articles entitled Mississippi Farmers Asked to Greatly Increase Peanut Acreage To Meet War Needs (pp. 1, 3), 250,000 Acres Soybeans for Grain—Food for Freedom (p. 2), and State Farm Goal—130,000 Acres of Peanuts for Oil (p. 3), all by J. M. Weeks and J. F. O'Kelly; and High Sirup Yields in 1941 Variety Test, Poplarville, by J. C. Robert (p. 8).

[Field crops experiments by the Puerto Rico University Station]. (Partly coop. U. S. D. A.). (*Puerto Rico Univ. Sta. Rpt.* 1941, pp. 2, 3, 6-8, 9-11, 38-41, 46, 50-54, 56, 57-58, 59, figs. 2).—Agronomic work (E. S. R., 86, p. 34) reported on by D. H. Cook, J. A. Goyco, M. C. Fernández, J. Pastor Rodríguez, L. A. Serrano, C. J. Clavell, F. J. Juliá, H. E. Cruz Monclova, P. Richardson, F. Méndez, F. Marrero, A. Roque, J. A. Bonnet, A. R. Brenes, R. Rodríguez Torrent, F. J. Ramírez Silva, G. A. Lebedeff, J. Adsuar, and E. Molinary Salés included variety, irrigation, cultural, and fertilizer tests, and comparison of varieties for animal feed, all with sugarcane; forage production of grasses and legumes; a storage experiment with beans; a fertilizer test with corn; breeding work with corn, cotton, beans, and sugarcane; variety tests with sweetpotatoes, yautia, cassava, and soybeans; and production tests with sunflower, castor-bean, and sesame.

Small grain production in the lowland region of southeast Missouri, B. M. KING (*Missouri Sta. Bul.* 440 (1942), pp. 39, figs. 12).—The adaptation of rye, oats, wheat, and barley to the lowland soils of southeast Missouri and methods of producing and using these crops efficiently are described, together with ways to manage them to serve best as nurse crops for legumes. Possibilities in

growing rice on certain lowland soils that have not generally supported a profitable agriculture based on production of standard Missouri crops are outlined, and methods for growing rice are suggested. Varieties indicated as desirable include Balbo rye, Columbia spring oats and Culbertson and Winter Fulghum winter oats, Missouri Early Premium wheat, Missouri Early Beardless and Michigan Winter barley, and Colusa, Early Prolific, and Lady Wright rice.

The conversion of the weights of mechanical separations of grain into percentages, E. G. BOERNER (*U. S. Dept. Agr. Cir. 623* (1942), pp. 20, fig. 1).—This supersedes Department Bulletin 574 (E. S. R., 38, p. 140).

Greenhouse germination and seedling propagation method studies in the improvement of some forage grasses, L. C. NEWELL (In *Abstracts of Doctoral Dissertations. Lincoln: Univ. Nebr., 1940, pp. 1-8*).—The most feasible order of germinating the seed and handling the seedlings for transplanting was determined from germination data and observations on seasonal growth of the seedlings, and a plan was formulated for producing successive crops of grass seedlings in the greenhouse. Records of seedling survival were kept on 90,000 seedlings transplanted to the field over 4 yr., best results in survival being secured when good seedling growth was produced in the greenhouse at such a time that seedlings could be moved to the field at the optimum time for transplanting each species. When this care was combined with reasonably favorable soil moisture conditions in the field, high percentages of seedling establishment were obtained.

Tests show no advantage in mixing grass with alfalfa on Colorado irrigated land, R. M. WEIHING and D. KOONCE (*Colo. Farm Bul. [Colorado Sta.], 4* (1942), No. 1, pp. 12-13, fig. 1).—Hay yields cannot be increased by planting brome grass, orchard grass, reed canary grass, or crested wheatgrass with alfalfa on irrigated soil in Colorado, according to experiments at the station and Fort Lewis Substation. Growers desiring some grass in their alfalfa hay can produce a first cutting with one-fourth to one-third of grass by planting brome grass or orchard grass with alfalfa, but the grass content of second, third, and fourth cuttings will be negligible. Grass in the alfalfa stands did not affect the rapidity with which alfalfa died from bacterial wilt, and the protein, Ca, and P contents of alfalfa grown alone were nearly the same as in grass-alfalfa mixtures. Grass grown with alfalfa contained more protein than that grown alone.

A comparison of bent turf from self- and open-pollinated seed and from stolons, J. A. DEFRAANCE. (R. I. Expt. Sta.). (*Turf Cult., 2* (1941), No. 3, pp. 169-177, fig. 1).—From 10 selected seeds of a single self-fertilized head from each of 5 strains, the 10 resulting plants produced plats of turf which varied in quality factors, as color, density, texture, vigor, and resistance to invasion by other grasses. Turf resulting from the planting of seed of either self- or open-pollinated heads contained a mixture of plants with different characteristics. Indications were that in using open-pollinated seed of improved strains of velvet bent, the number of desirable plants similar to the strain type predominated, particularly during the first few years after establishment of the plats.

[Corn investigations in Iowa]. (Partly coop. U. S. D. A.). (*Iowa Sta. Rpt. 1941, pt. 2, pp. 7-13, 15-17, 22, 24, 28-34, 36-40, 41-47, figs. 8*).—Experimentation with corn (E. S. R., 85, p. 184) reported on by H. D. Hughes, G. F. Sprague, H. R. Meldrum, W. H. Pierre, J. B. Davidson, I. J. Johnson, R. C. Eckhardt, E. V. Collins, C. K. Shedd, J. L. Robinson, A. L. Bakke, R. M. Hixon, W. G. Gaessler, R. H. Porter, M. Henning, M. E. Crowson, M. S. Zuber, J. C. Eldredge, L. C. Burnett, and E. W. Lindstrom as projects under the Iowa Corn Research Institute dealt with genetic relations of inbred lines, including second- v. first-cycle inbred lines, the relative value of intensive (self-fertilization) v. a milder (sibbing) form of inbreeding at the beginning of the inbreed-

ing program on the phenotype and yielding ability of inbred lines, and top-root ratios of four inbreds and four single crosses of corn grown on three P levels; genetic transfer of starch characteristics; other genetic studies; improving inbred lines by crossing followed by selfing and sibbing; improvement through use of inbred lines; growth response of hybrids and varieties on soils of different fertility levels and various soil types; tests of varieties, strains, and hybrid combinations in different parts of Iowa; response of inbred lines and hybrids to fertilizer applications; a comparative study of stem and root development of hybrids and their single crosses and inbreds as to anatomical features at successive developmental stages; hill spacing of check planted corn; soil fertility and crop rotations as related to corn yields; maintenance of pure seed sources of improved varieties through field inspection and certification; production and distribution of seed of hybrids and of their parents; and breeding, varietal, fertilizer, and popping studies with popcorn. Additional research related to corn production had to do with seed increase of new or improved varieties of other field crops, techniques used in seed analysis, physiology of field bindweed (*Convolvulus arvensis*) in relation to control, and weed control in growing corn.

The 1941 Iowa corn yield test, J. L. ROBINSON and M. S. ZUBER. (Coop. U. S. D. A. et al.). (*Iowa Sta. Bul.* P38, n. ser. (1942), pp. 301-377, fig. 1).—The 479 entries including 1,437 district entries in the 12 fields of the 1941 test were grown in the same groupings and cooperatively as in previous years (E. S. R., 85, p. 45). The average yield in bushels per acre for all fields was the lowest since 1936, while the average percentage stand was the highest for any year of the test. The average percentage of lodged plants was about five times that of 1940 and much higher than in any other year since lodging has been determined on a percentage basis. Large differences in yield, existing between highest- and lowest-yielding regular hybrids when compared in the same section, were similar to those in previous years, and showed clearly that some hybrids are not superior in ability to yield. The one adapted open-pollinated variety planted in each district was the lowest-performing entry in five districts, while a hybrid was rated lower in the other seven districts, additional evidence that not all hybrids are outstanding in performance. In the 1941 test an experimental hybrid was the highest-performing entry in four districts and the lowest-performing in one district.

The highest-performing section entries with scores in regular hybrid and experimental hybrid classes, respectively, were for the northern section Ioway Supercorn 218-H, Funk Hybrid G-28; north-central section Pioneer 333, Thompson 52; south-central section Dockendorff 13, 168×169; and for the southern section Ioway Supercorn 218-H, Iowa Hybrid 4041. The grower of Ioway Supercorn 218-H, because of performance in the northern section, was awarded a trophy for the regular section entry having the highest performance score. This hybrid also made creditable showings in other sections of the test.

Measuring hybrid corn for Michigan, 1939-1941 trials, A. R. MARSTON (*Michigan Sta. Quart. Bul.*, 24 (1942), No. 3, pp. 167-198, figs. 5).—The current and 3-yr. performances of corn hybrids (E. S. R., 85, p. 185) in tests under the direct supervision of the station in 7 counties are tabulated and discussed, and the results of supplementary trials in 14 other counties in 1941 are reported (pp. 180-198) by A. A. Johnson. The hybrids tested for longer than 1 yr. are grouped, and their approximate zone adaptations are indicated on an outline map.

Early North Dakota corn hybrids, W. WIDAKAS (*North Dakota Sta. Bmo. Bul.*, 4 (1942), No. 4, pp. 13-15).—Yield and other agronomic data are shown for

four early experimental yellow dent hybrids and standard check varieties in the station nursery, 1938-41, and for several areas in the State, 1941. The plan for release of crossing seed stocks and the system of numbering maturity groups are discussed briefly.

Corn variety and hybrid performance, W. WIDAKAS (*North Dakota Sta. Bimo. Bul.*, 4 (1942), No. 4, pp. 24-28).—Comparative grain and fodder yields of promising corn varieties and hybrids are reported from cooperative field trials and station tests in 1941, with averages since 1935. Suitable varieties and hybrids are again (*E. S. R.*, 85, p. 186) suggested for different areas in the State, and methods for growing the crop are outlined briefly.

Cotton variety experiments in Georgia, 1937-1941, R. P. BLEDSOE and U. R. GORE (*Georgia Sta. Cir.* 134 (1942), pp. 4).—In continued variety tests with cotton (*E. S. R.*, 84, p. 614), Stoneville 2B led three north Georgia tests in money value per acre and was high in average lint yield, and was approached by D. and P. L. 11A and 12 and Coker 100. The latter has a good record in north Georgia but is very susceptible to wilt. Varietal leaders in four south Georgia tests on wilt soil were Coker 4-in-1, Coker Cleve-wilt 7, and W. W. Wannamaker Cleveland Wilt Resistant, all highly wilt-resistant, stapling 1 in. or better, and with a fair gin turn-out and good-sized boll.

Weed control and cotton tillage on Blackbelt (Prairie) soils, T. N. JONES, I. E. HAMBLIN, and O. A. LEONARD (*Mississippi Sta. Tech. Bul.* 29 (1941), pp. 64, figs. 39).—In seedbed preparation studies with cotton, 1932-40, fall and winter preparations produced the highest acre yields of seed cotton, and deep preparation resulted in slightly higher yields than shallow preparation. The methods recommended include plowing in the fall or winter and bedding in the spring with a breaker (middlebuster), or, with spring preparation, bedding with two operations of the breaker or its equivalent. A comparative test, 1939-40, suggested that preparation has more effect than cultivation on yields. Cultivating experiments involving various implements, rates, and depths showed that cotton must be cultivated in order to control weeds. The cultivation may be done most efficiently about every 10 or 12 days, ending between July 1 and 10, and employing methods and implements that will control weeds with minimum injury to the crop. Draft measurements, 1932-35, revealed that the amount of machine operation or the power expended on a crop is not a measure of the yield. According to a special study to determine effects of the various tillage practices on the growth and development of cotton roots on Houston clay soil, the root systems are shallow during the cultivating season, and therefore cultivation should be shallow to minimize injury to the roots, especially after the plants are 6 to 8 in. high. Deep seedbed preparation favored the development of a deeper root system than shallow seedbed preparation, indicating that cotton on deep preparation could be cultivated deeper than cotton on shallow preparation. Johnson grass was eradicated from this soil by spraying with sodium chlorate or Atlacide.

Factors affecting the longevity of cottonseed, D. M. SIMPSON. (*U. S. D. A. coop. Tenn. Expt. Sta.*). (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 7, pp. 407-419, fig. 1).—Cottonseed stored in bags under humid and fairly high temperature conditions near Charleston, S. C., deteriorated rapidly after 2 yr., but seeds with moisture content reduced below 8 percent and stored in tin containers to prevent rapid reabsorption of moisture retained viability with slight impairment for 7 yr. Cottonseed containing 11 percent moisture and sealed in glass jars was worthless for planting after 2 years' storage, but other lots containing 6 and 8 percent moisture were still viable after 7.5 yr. Seed of two upland cottons was adjusted to several levels of moisture ranging from 7 to 14 percent

and stored at Knoxville, Tenn., at constant temperatures of 90°, 70°, and 33° F. and with checks at uncontrolled air temperature. Seeds containing 14 percent moisture and stored at 90° were all dead in 4 mo., and after 36 months' storage only those seeds with 7 percent moisture were germinable. All seeds stored at 33°, however, retained viability for 36 mo. without appreciable loss. Cotton-seeds kept at air temperature and at 70° were intermediate in moisture tolerance. Seedling mortality in field germination tests indicated that low storage at 33° was also favorable for survival of anthracnose spores on the seeds. With increased seed moisture or higher storage temperature, a corresponding increase occurred in the percentage of free fatty acids in the oil of stored seeds. See also earlier notes (E. S. R., 73, p. 469).

Which flax varieties to grow in 1942, T. E. STOA (*North Dakota Sta. Bimo. Bul.*, 4 (1942), No. 4, pp. 2-6).—Merits and limitations of available flax varieties, as observed in comparative tests, are set forth for the Bison, Buda, Redwing, Walsh, B. Golden, Smoky Golden, Viking, and Linota varieties. Agronomic data tabulated for various periods include yield, height, maturity, seed size, oil content and quality, and rust resistance.

Korean lespedeza in Kansas, K. L. ANDERSON (*Kansas Sta. Cir.* 210 (1941), pp. 12, figs. 8).—The characteristics and adaptations of Korean lespedeza (*Lespedeza stipulacea*) are described, and practical information is given on its soil and fertility needs, seedling methods, uses in temporary and tame perennial pastures and in native pastures and for soil improvement and erosion control, harvesting the seed crop, and control of dodder and other weeds found in lespedeza fields.

Potato growing in Iowa, E. S. HABER. (Coop. U. S. D. A.). (*Iowa Sta. Bul.* P41, n. ser. (1942), pp. 405-412).—Practices outlined for satisfactory and profitable yields of potatoes include choice and preparation of soils, fertilizers, varieties, seed and treatment, planting, culture, spraying or dusting, and harvesting and storage.

Rate of nutrient absorption by different varieties of potatoes in Aroostook County, Maine, A. HAWKINS. (Maine Expt. Sta.). (*Amer. Fert.*, 96 (1942), No. 6, pp. 5, 6, 24, 26, fig. 1).—This is a preliminary report on fertilizer tests to determine the rate of plant food absorption by several potato varieties having different lengths of growing period, the varieties chosen being Cobbler (early), Chippewa (intermediate), Green Mountain (late), and Smooth Rural (very late).

Spelt in Michigan, H. M. BROWN (*Michigan Sta. Cir.* 180 (1942), pp. 12, figs. 5).—Practical information is presented on the characteristics of the plant and grain of spelt; its growth habits; diseases and insect pests; cultural and field practices in growing spelt as a nurse crop for alfalfa, clover, and sweet-clover; and harvesting it with binder or combine. The place of spelt in Michigan agriculture is discussed, with especial reference to competition with wheat and oats and comparative acre yields of grain, and comparative feeding values, all based on station studies.

The nitrogen requirement of sugar beets, R. GARDNER and D. W. ROBERTSON (*Colorado Sta. Tech. Bul.* 28 (1942), pp. 32, figs. 16).—Effects of various N treatments applied to the soil on quality and yield of sugar beets and on the nitrate content of the soil were studied, 1933-37. The sugar percentage was decreased by nitrates when more nitrates were present than could be used by the beets before harvest. Reduction in sugar percentage approximated a straight line function of the nitrate N in the beets at harvest time, and each 0.025 percent of nitrate N in the beets reduced the sugar by an average of about 1 percent. From 50 to 100 lb. of excess nitrate N applied to the soil was required to reduce

the sugar 0.5 percent. Beet yields tended to rise with increase in nitrate as the sugar percentage declined until a maximum sugar yield was reached. Sugar yield was affected less by excesses of nitrates than was beet yield, and rather large reduction in sugar percentage occurred before there was any significant loss of sugar yield.

Manure, from 10 to 15 tons per acre, increased the beet yield without any significant lowering of the sugar percentage. Manure applied the summer or fall before planting beets gave slightly better results than that applied a year before or just before beets, whereas fresh manure applied just before planting gave poorest results. Fresh, strawy, and well-rotted manure did not differ much in effects when applied at the same rates based on dry matter content.

N as ammonium sulfate gave about the same results per unit of N as N applied as calcium nitrate, and was practically all converted to nitrates during the first season. Large excesses of nitrates applied to the soil were largely leached from the soil during the first 2 yr. after application. Nitrates in the soil varied widely during the season, but dropped markedly late in the year when the crop was making greatest demands and remained at a low level during the rest of the season. A rather high available N level during the first year of beets after alfalfa was indicated, with a rapid decrease in the second and third years.

Composition of sugar cane plants grown in deficient nutrient solutions, H. F. CLEMENTS, J. P. MARTIN, and S. MORIGUCHI. (Hawaii Expt. Sta.). (Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 45 (1941), No. 4, pp. 227-239, fig. 1).—Plants of the sugarcane variety 31-2806, after being grown in various deficiency solutions (E. S. R., 86, p. 38), were analyzed for moisture, reducing sugars, sucrose, total sugars, acid-hydrolyzable carbohydrates, total N, K, P, and Ca. All deficiencies had marked effects in the amount of leaf growth produced; —N, —P, and —K produced reductions in leaf growth which were very nearly reflected in the total amount of growth made. Substantial differences existed in the moisture content of plants produced in the various cultures. The moisture content of the young leaf sheath was a good index to the general moisture status of the whole plant. Reducing sugars were low in all but the —K culture; sucrose was highest in cane of the —Ca culture; while acid-hydrolyzable carbohydrates varied little among cultures. The quality ratios of the —Mg, —B, and —Fe were very poor, while in the other cultures there were small variations. Correlation between quality ratio and total sugar level of the young sheaths, except for the —Fe culture, was very good. The influences of the various deficiencies on the amounts of N, P, and K found in the various tissues are presented.

Cane growth studies: Factors which influence yields and composition of sugar cane, R. J. BORDEN (Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 45 (1941), No. 4, pp. 241-263, figs. 4).—Further research concerned with some of the factors which influence yields and composition of sugarcane, in which four ratoon crops harvested from the same plantings verified much of the data originally reported on (E. S. R., 75, p. 774) and identified certain interactions involved. Definite effects were measured from different soils, varieties, and levels of fertilization, but these were all modified considerably by differences in climatic influences, chiefly sunlight and temperature, under which the crops were grown.

A ten year fertilizer experiment on tobacco, J. JOHNSON and W. B. OGDEN (Wisconsin Sta. Res. Bul. 141 (1941), pp. [21]+24, figs. 8).—In fertilizer experiments during the period 1929-38 on a fairly heavy (Miami) silt loam at Madison, manure up to 40 tons per acre and straw were compared with different kinds and rates up to 1 ton per acre of commercial fertilizer mixtures alone and in combination with manure and straw. The data are presented in the form of average

yield of cured tobacco, general quality-index based on grading, leaf burn based on leaf-burn tests, and a relative fertilizer-value-index based on the above factors and the net returns from each treatment.

When yield and quality alone were considered, the best results were secured with manure or with manure in combination with commercial fertilizer. The fertilizer value of 1,000 lb. of a 2-8-12(S) mixture was about equal to that of a 20-ton manure application, although the mixture did not maintain the general soil fertility at the level attained by the manure. The actual value of tobacco in Wisconsin depends increasingly upon its burning quality. With respect to leaf burn, neither manures nor commercial fertilizers yielded any improvements. This was attributed chiefly to the nature of the soil, which reduced the availability of the K to the plant; the chlorine content of the manures and to some extent in the commercial fertilizers used and its accumulation in the soil; and the presence of other obscure factors.

A new wheat variety for western N. D., L. R. WALDRON (*North Dakota Sta. Bimo. Bul.*, 4 (1942), No. 4, p. 10).—Vesta, an awned wheat with the same parentage as Rival (E. S. R., 86, p. 186), was found best adapted to western North Dakota. It yields well, holds the kernels tightly, has moderate strength of straw, surpasses Rival and Pilot in resistance to stem rust although less resistant to leaf rust, and in milling and baking tests has compared satisfactorily with Thatcher and other good bread wheats.

Better wheat for Oklahoma, H. S. SMITH (*Oklahoma Sta. Cir.* 99 (1942), pp. [3]).—The objectives, methods, and results obtained in the cooperative Oklahoma Farm Wheat Improvement Program are outlined with agronomic data from tests, 1939-41, of important varieties and the numbers of cars of wheat, 1937-41, degraded because of rye, smut, and mixtures.

Rate and date of seeding Kanred winter wheat and the relation of seeding date to dry-land foot rot at Akron, Colo., D. W. ROBERTSON, O. H. COLEMAN, J. F. BRANDON, H. FELLOWS, and J. J. CURTIS. (Colo. Expt. Sta. coop. U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 6, pp. 339-356, figs. 6).—Seeding experiments, 1920-37, demonstrated that planting winter wheat at different dates results in significant differences in yields on summer fallow in eastern Colorado. The crop evidently should be planted between September 1 and 15 for best yields on summer fallow or cornland and at the rate of 2 pk. of seed per acre. Effects of high temperature on incidence of dry-land foot rot and resulting effects of the disease on the plant make up one of the main factors in reducing yields in the earlier August 15 plantings, while low temperature is the main factor in reducing yields in plantings after September 15. Other factors, as moisture and winter-killing, may act independently of planting rates or dates in reducing yields.

Commercial agricultural seeds, 1941, G. P. STEINBAUER (*Maine Sta. Off. Insp.* 182 (1941), pp. 112-141).—The percentages of purity, germination, weed seeds, and hard seed (in legume seed), and number of noxious weed seed per pound, are tabulated for 206 samples of agricultural seed collected from dealers in Maine in 1941.

The menace of weeds, R. J. EVANS (*Farm and Home Sci. [Utah Sta.]*, 3 (1942), No. 1, pp. 10-11, figs. 9).—The status of the weed problem in Utah is reviewed, with particular attention to control costs, depreciation of crop yields and market values, and the total acreages of 21 noxious weeds in the State.

HORTICULTURE

Correlation from ranks, for horticultural research, J. W. CRIST. (Mich. State Col.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 593-595).—A procedure in correlation, known as correlation from ranks, is described and discussed. The coefficient of correlation from ranks is said to be essentially a modified form of the ordinary coefficient of linear correlation. The use of the procedure is suggested when (1) with the actual values of the variates at hand, it will give, with greater ease and speed, the desired information, and when (2) with the actual values of the variates missing, perhaps unattainable, it will give enough information to be decidedly helpful.

[**Horticultural studies by the Delaware Station**] (*Delaware Sta. Bul.* 235 (1941), pp. 29-33).—Progress on the following studies is noted: A comparison of seedling- and own-rooted apple trees, the value of Malling rootstocks for Gallia Beauty and Blaxtayman apples, soil management studies with the apple, and the use of poultry manure for fertilizing strawberries, all by E. W. Greve; hormone sprays for the prevention of excessive drop of apples, by Greve and K. J. Kadow; apple varieties, by Greve; cantaloup and watermelon variety tests, by W. H. Phillips and Kadow; the culture of tomatoes, by E. P. Brasher and C. E. Phillips; and the self-fruitfulness of peaches and the breeding of cabbage, both by L. R. Detjen.

[**Horticultural studies by the Iowa Station**]. (Partly coop. U. S. D. A.). (*Iowa Sta. Rpt.* 1941, pt. 1, pp. 132-133, 135, 183-200, 201, 203-204, 205-208, figs. 7).—Among studies the progress of which is discussed are those by J. M. Alkman, J. E. Sass, E. C. Volz, T. J. Maney, B. S. Pickett, H. L. Lantz, H. H. Plagge, E. S. Haber, and A. T. Erwin on establishment and management of vineyards; growth of plums and walnuts; interplanting tests in hill culture to check erosion; time and manner of flower bud formation in tulips; testing of roses, peonies, and various annuals for heat resistance and use in cut-flower production; methods of growing uniform stocks and development of new stocks, particularly dwarfing stocks, for the apple; systems of soil management for apple orchards; apple, pear, plum, and peach breeding; old v. new apple varieties; breeding anthracnose-resistant black raspberries; variety, cultural, fertilizer, and irrigation studies with strawberries on Muscatine Island; stock and scion relation in the apple; breeding and testing rose stocks; freezing preservation of fruits and vegetables; effects of modification of storage atmosphere on the physiological and storage responses of grapes and apples; asparagus culture; variety tests of tomatoes, muskmelons, sweet corn, and watermelons; improvement in type and quality of canning pumpkins; and breeding onions.

[**Horticultural studies by the Maine Station**] (*Maine Sta. Bul.* 405 (1941), pp. 401-408, 412-415, 417-418, 420-421, 509-510, figs. 3).—Included are brief reports on the following studies: A survey of the apple industry in Maine, by C. H. Merchant; apple breeding, by R. M. Bailey and I. M. Burgess; the use of preharvest sprays to reduce dropping and the relationship of size of apple seedlings to subsequent growth, both by Bailey; the factors involved in the winter injury of apple trees, by M. T. Hilborn; sweet corn breeding, by Bailey and W. B. Ennis, Jr.; effect of planting rate on the yield and grade of snap beans, effect of harvest interval on yield and grade of snap beans, and variety trials with vegetables, all by Burgess; breeding of cucumbers resistant to scab, by Bailey and Burgess; breeding and selection of blueberries, burning blueberry fields, control of weeds in blueberry fields, and the relation of bees to fruitfulness in the blueberry, all by F. B. Chandler and I. C. Mason; and the development of blueberry byproducts, by Chandler and M. E. Highlands.

[**Horticultural studies in Mississippi**] (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 3, pp. 1, 5, 6, 7, figs. 8).—Brief notes are given entitled Spring Vegetables Much Benefited by Nitrate Treatment, by L. R. Farish (pp. 1, 6); Spray Schedule, Carefully Followed, Necessary for Production of Quality Fruit, by T. E. Ashley (pp. 1, 5); Unfruitful Pecan Trees or Producers of Inferior Nuts Improved by Topworking, by C. H. Ragland (p. 6); and Methods of Pruning Recommended for Maintaining Beauty of Shrubbery Planting, by F. S. Batson (p. 7).

[**Horticultural studies by the University of Puerto Rico Station**] (*Puerto Rico Univ. Sta. Rpt.* 1941, pp. 4, 5, 6, 44-45, 47-48, 59-62, 65-67, fig. 1).—In this general progress report, information is presented on studies of coffee with respect to fertilizers, shade trees for coffee plantations, asexual propagation, effect of different solar radiation intensities on growth and yields, pruning, and effect of lime, all by J. Guiscafré Arrillaga and L. A. Gómez; nutrient requirements of coffee, by Guiscafré Arrillaga, Gómez, and N. A. Schappelle; selection and propagation of avocados, by J. S. Simons; fertilization of grapefruit, by Simons, L. A. Serrano, and C. J. Clavell; the culture of grapes and guavas, rootstocks for the mango, selection of mango varieties, and the improvement of native oranges by selection, all by Simons; the waxing of pineapples to improve shipping quality, by Schappelle; variety tests of strawberries, by A. Riolano and F. J. Juliá; and the testing of pumpkin varieties, by E. Molinary Salés.

Fungicides and insecticides, 1941, E. R. TOBEY (*Maine Sta. Off. Insp.* 182 (1941), pp. 142-152).—The results of analyses of 77 samples of fungicidal and insecticidal materials collected during the 1941 season are presented, together with the text of the State law as an appendix.

Victory vegetable gardens, E. S. HABER (*Iowa Sta. Bul.* P40, n. ser. (1942), pp. 397-404).—Brief useful information is presented on the location of gardens, soils, fertilizers, preparation of the soil, planting, cultivation, succession of crops, watering, etc.

Vegetables for vitality for victory, L. H. POLLARD (*Farm and Home Sci. [Utah. Sta.]*, 3 (1942), No. 1, pp. 3, 15, fig. 1).—General information is presented on the planning and planting of home gardens, with a view to increasing the supply and nutritive value of garden produce.

The response of four vegetable crops to different nitrogen carriers, W. L. BARTHOLDI and T. E. ODLAND. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 633-636).—In a study using seven different nitrogen sources as individual nitrogen carriers in a complete mixture approximating a 5-10-5 analysis, no significant differences were found in the yields of beets and lettuce. On the average, there was also little difference in the comparative effectiveness of the various nitrogen carriers for the early spinach or cabbage. Cabbage produced the largest yields with nitrate of soda, but the average yield was not significantly greater than that obtained with calcium nitrate, calnitro, sulfate of ammonia, or a combination of nitrate of soda and sulfate of ammonia. In a comparison of synthetic and Chilean nitrate of soda for spinach and cabbage, there was no significant difference in yields.

Further studies on the effects of synthetic growth substances on cuttings and seeds, L. C. CHADWICK and J. O. SWARTLEY. (Ohio State Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 690-694).—In this further contribution (E. S. R., 86, p. 623), the results are discussed of various experiments, such as the effects of acidity of growth substances on rooting and of talc dust alone, the relation of high bottom heat to the effectiveness of growth substances, and the effects of retreatment with growth substances on the rooting

of evergreen cuttings, vitamin B₁ on evergreen cuttings, injury to the base of the cutting before treatment, and seed treatment.

Wartime starter solutions to meet present emergency, C. B. SAYBE (*Farm Res. [New York State Sta.]*, 8 (1942), No. 2, pp. 2-3, 5, fig. 1).—The author points out the prospective shortage of certain fertilizing materials and discusses the results of preliminary greenhouse tests with various possible substitutes. Among promising treatments, all dissolved in 50 gal. of water, were 10 lb. of either acid-forming or non-acid-forming types of 4-16-4, 5-10-5, and 5-10-10 mixtures.

Seed treatments recommended for different vegetables, G. L. McNEW (*Farm Res. [New York State Sta.]*, 8 (1942), No. 2, pp. 1, 19).—Treatments are suggested for lima bean, sweet corn, beet, spinach, cabbage, cucumber, and carrot seeds prior to planting.

Reduced germination in beans and peas, W. CROSIER and F. KEAFF (*Farm Res. [New York State Sta.]*, 8 (1942), No. 2, pp. 5, 11).—It was found that split seeds reduced the germination of many seed stocks, and that treatment with certain chemical dusts or solutions increased the accuracy of germination tests by preventing the rotting of normally strong seeds.

Pea seed responds to treatment, G. L. McNEW (*Farm Res. [New York State Sta.]*, 8 (1942), No. 2, pp. 9-10, 11, fig. 1).—Certain new organic materials found effective in reducing losses from seed decay and thereby increasing yields are discussed as to their use and value.

Are inoculated peas late in maturing? A. W. HOFER and J. K. WILSON (*Farm Res. [New York State Sta.]*, 8 (1942), No. 2, pp. 13, 18).—Observations on the effect of inoculation of peas on the time of maturity of the crop indicated that in the majority of the fields under test inoculation had little or no effect on maturity. It is suggested that when inoculation is effective in promoting growth it may incidentally delay maturity slightly.

Vegetable soybeans, M. G. WEISS, C. P. WILSIE, B. LOWE, and P. M. NELSON. (Coop. U. S. D. A.). (*Iowa Sta. Bul. P39, n. ser. (1942), pp. 381-395, figs. 6*).—In connection with descriptive material regarding edible varieties, information is given as to the proper stage of harvest, palatability, and canning. A total of 93 varieties was tested, and information is presented as to the time of maturity, plant growth, seed characters, etc., of certain outstanding kinds. A summary of agronomic data and palatability scores is appended.

Tomatoes for Oklahoma gardens, H. B. CORDNER (*Oklahoma Sta. Cir. 98 (1942), pp. 4, fig. 1*).—Brief information is presented on tomato growing, with special reference to the causes of unfruitfulness, the value of well-grown plants, and on varieties for eastern and western portions of the State.

Bounty tomato (*North Dakota Sta. Bimo. Bul., 4 (1942), No. 4, p. 12*).—Brief information is presented on a study by H. Mattson of the yield of this new variety of tomato developed by the station.

Plant tests as a guide to fertilizer treatment of tomatoes (preliminary report), E. M. EMMERT. (Univ. Ky.). (*Amer. Soc. Hort. Sci. Proc., 38 (1941), pp. 621-622*).—In extensive greenhouse trials with soil and soilless cultures and in outdoor trials at two locations, numerous plant tests were made on the crops and the results were correlated with yields. The plant tests showed the response to nutrient treatment under all the conditions and indicated rather accurately the availability of nutrients to the plant. A program for fertilization of the tomato plant is suggested.

Growth and yield of the tomato plant when hardened with certain nutrient solutions, E. P. BRASHER. (W. Va. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 38 (1941), pp. 629-632*).—Plants checked in their growth by increasing

the concentration of potassium sulfate in the nutrient solution or by decreasing the nitrogen were compared with plants kept in a highly vegetative condition by increasing all the major salts in the nutrient solution. All lots showed improved color shortly after setting in the field, but the tender vegetative lot grew much more rapidly. At the first harvest, 52 percent of the tender plants yielded marketable fruits as contrasted with 26 percent for both hardened lots. When mean yield differences were expressed as percentages it was found that the tender plants had yielded 12 percent more early and 15 percent more total marketable fruits than did the better of the two hardened lots.

The effect of the topping of young tomato plants on fruit set and yield, K. C. WESTOVER. (W. Va. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 517-522).—With plants spaced every 5 ft. in rows 5 ft. apart, it was found that topping by the simple pinching off of the main stem above the second leaf tended to increase the early yields but reduced fruit set and total yields in the majority of cases. The increased early yield was difficult to explain unless the growth-checking effect due to topping was outgrown quickly and an increase in set resulted which contributed to the increase in yield in the early part of the season.

Chemically induced parthenocarp in certain horticultural plants, with special reference to the watermelon, C. Y. WONG. (Mich. Expt. Sta.). (*Bot. Gaz.*, 103 (1941), No. 1, pp. 64-86, figs. 8; *abs. in Michigan Sta. Quart. Bul.*, 24 (1942), No. 3, p. 257).—Essentially noted (E. S. R., 81, pp. 492, 513).

Soil acidity for watermelons on sand, J. D. HARTMAN and F. C. GAYLORD. (Purdue Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 623-625).—Hawkesbury watermelons, grown on plats the soil of which was brought to different pH levels by the use of sulfur or liming materials, showed no significant differences with respect to yield, size, or soluble solids content within the pH range of 4.7 to 7.4 as determined in August of the cropping season. Averages for taste index numbers were also practically the same. The soils were rather high in available manganese as indicated by the Spurway test (E. S. R., 60, p. 328).

Spraying, pruning, and fertilizing will increase fruit production in home gardens, F. M. COE (*Farm and Home Sci. [Utah Sta.]*, 3 (1942), No. 1, pp. 6-7, figs. 2).—Information is given on spraying, pruning, and fertilizing of fruit orchards and on the planning of fruit plantings with a view to increasing the supplies and improving the quality. Small fruits, such as berries, are given particular consideration because their production may be more rapidly increased.

Orchard soil management under war emergency, R. C. COLLISON (*Farm Res. [New York State Sta.]*, 8, (1942), No. 2, pp. 12-13).—The author asserts that many of the usual nitrogen fertilizers are no longer available and discusses possible substitutes. Cultural practices that stimulate nitrogen accumulation in the soil are recommended.

Factors which make for success in orcharding, H. P. GASTON (*Michigan Sta. Cir.* 181 (1942), pp. 29, figs. 7).—Based on a study of successful, intermediate, and unsuccessful orchard enterprises, the author discusses certain factors underlying success. Among these are a good knowledge of horticulture, the selection of good soil on a relatively frost-free site, good management of the soil, adequately sized and adequately equipped enterprises, productively aged trees, good commercial varieties, diversity of fruit crops, the use of methods that produce high-grade fruit, and effective personal management.

Permanent grass cover for the orchard, N. L. PARTRIDGE and C. M. HARRISON (*Michigan Sta. Quart. Bul.*, 24 (1942), No. 3, pp. 211-217, figs. 4).—Because of the lower cost of maintaining orchards in sod cover rather than clean cultivation with cover crops and also because of the better performance of most decidu-

ous fruits under the sod mulch, the authors discuss methods of seeding orchard soils, the kinds of grass to use, the use of fertilizers, the care of the grass, and the protection of the trees from rodents.

New twentieth century peaches bred and tested in New Jersey (*New Brunswick: N. J. Peach Council, 1939-40*, [pp. 161, figs. 18]).—Included are descriptive accounts of nine new commercial peaches and one nectarine bred by the New Jersey Experiment Stations.

Strawberry culture: Western United States, G. M. DARROW and G. F. WALDO (*U. S. Dept. Agr., Farmers' Bul. 1027, rev. (1941), pp. 11+26, figs. 17*).—This revision of the earlier edition (*E. S. R. 40, p. 838*) presents information on soils and their preparation, training systems, propagation, planting, culture, varieties, harvesting, shipping, and utilization.

Making soils acid for blueberries, R. C. COLLISON (*Farm Res. [New York State Sta.], 8 (1942), No. 2, pp. 8, 18*).—The author states that blueberries need a distinctly acid soil with the optimum near pH 4.5, discusses ways of modifying the soil reaction, and recommends sulfur as the most economical agent for this purpose.

Harvesting and handling cultivated cranberries, H. F. BAIN, H. F. BERGMAN and R. B. WILCOX (*U. S. Dept. Agr., Farmers' Bul. 1882 (1942), pp. [2]+24, figs. 18*).—This supersedes Farmers' Bulletin 1402 (*E. S. R., 51, p. 646*). Information is presented on methods of harvesting, storage, preparation of cranberries for shipment, marketing operations, canning, etc.

Developments in fertilization and orchard management, A. H. FINCH. (*Ariz. Expt. Sta.*). (*Calif. Citrog., 27 (1942), No. 4, pp. 90, 114-115, figs. 2*).—Based on the results of studies upon the management of citrus orchard soils, this report points out certain cultural and fertilizer practices through which the yield and quality of the fruit may be modified.

The present status of rough lemon rootstock, A. F. CAMP. (*Fla. Expt. Sta.*). (*Citrus Indus., 22 (1941), No. 9, pp. 5-7, 9, 18*).—Analyses of oranges and grapefruits growing side by side on rough lemon and sour orange rootstocks showed that the same variety on sour orange will have a higher percentage of juice and the juice will have a higher specific gravity and more sugar and acid. The differences were more marked in oranges than in grapefruit. In oranges the differences in total soluble solids were of the magnitude of 1.5 to 2.0 percent. However, none of the fruit measured up to the soluble solids content expected in first-class material.

In a subsequent experiment under better fertilizer conditions, trees on sour orange again showed their superiority, but all the fruit was so much improved with respect to soluble solids that even that from trees on rough lemon would have been acceptable on any market. A group of Pineapple orange trees on rough lemon stocks produced fruit much of which had a soluble solids content of 11 percent or higher, which meant excellent quality. With proper fertilization it is considered possible to produce fruit on rough lemon rootstock, even on light sandy soil, by the proper use of magnesium, manganese, copper, and zinc in addition to the usual fertilizer materials.

Composition of the juice of orange fruits from oil-sprayed and HCN-fumigated trees, W. B. SINCLAIR, E. T. BARTHOLOMEW, and W. EBELING. (*Calif. Citrus Expt. Sta.*). (*Calif. Citrog., 26 (1941), No. 11, pp. 322, 346-348, figs. 2*).—The spraying of citrus trees with light-medium oils in concentrations of 0.25 to 1.75 percent caused a reduction in the total soluble solids and total and reducing sugars of the fruit juice. There was a tendency toward a reduction in titratable acidity. Within the range of 0.75- to 1.75-percent concentrations there were only slight differences in composition. The location of the grove and the

type of soil had little influence on the observed results. Fumigation with HCN in either the fall or winter had no marked effect on the chemical composition of the mature fruit.

Studies with rooting media for Florida ornamentals, J. V. WATKINS and G. H. BLACKMON. (Univ. Fla.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 683-686).—In a comparison of sand alone and sand modified with various materials, including peat moss, peanut hulls, pecan hulls, and sawdust, for propagating cuttings, a distinct advantage was found in favor of the mixtures. There was no significant difference in response to the several mixtures. The various species differed in their tolerance to rooting mixtures, with the *Otaksa hydrangea* showing the greatest and *Ilex cornuta* and *Ficus repens* (= *pumila*) the least tolerance.

Studies with rooting media for cutting of ornamentals, J. V. WATKINS and G. H. BLACKMON. (Univ. Fla.). (*Florists Each. and Hort. Trade World*, 96 (1941), No. 21, pp. 13, 15).—Essentially noted above.

Vitamin B₁ (thiamin) and other vitamins as fertilizers, G. S. FRAPS and J. F. FUDGE (*Texas Sta. Cir.* 95 (1942), pp. 16).—Vitamin B₁ produced a slight increase in the size of zinnia blooms, and some increase in the size of pansy plants and in the number of pansy blooms, but had no favorable effect on snapdragons, begonias, cineraria, alternanthera, and *Asparagus plumosus*. There was some evidence that vitamin B₁ may aid some species of plants to overcome the shock of transplanting by stimulating the growth of roots. It is suggested that the majority of plants produce in their own leaves sufficient amounts of vitamins for their own needs and that other plants obtain sufficient quantities from the soil.

Nutritional symptoms in the carnation, R. CLAPP and G. E. FOLLEY. (Univ. Maine). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 673-678).—Peter Fisher carnation plants, grown in sand in glazed jars, showed no clearly defined symptoms from either an excess or a deficient nutrient supply, except in the case of low-nitrogen plants whose leaves turned yellow and whose growth was stunted. The best-appearing plants were those receiving the complete, excess-calcium, and excess-nitrogen solutions. Plants receiving an excess of potassium were stunted and ultimately yellowed at the tips. A deficiency in nitrogen or phosphorus and an excess in calcium decreased the percentage of split blooms as compared with the controls. All other treatments increased the percentage of split blooms.

The effect of short days upon the development of the fall blooming chrysanthemums, E. P. HUME. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 665-668, fig. 1).—At least 20 short days were required before flower buds developed on any cutting propagated and grown under long days. The first bud formed on the terminal cutting. As a result of exposure to 20 short days axillary buds were changed progressively down the stem until the midpoint was reached. At any position on the upper portion of the stem the first type of flower bud formed was the crown bud. Very little additional reproductive development occurred after the cuttings were made and subjected to long days.

The effect of light intensity on response of *Euphorbia pulcherrima* and *Euphorbia fulgens* to photoperiod and temperature, K. POST. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 663-664).—Plants grown at Ithaca, N. Y., during the summers of 1938 and 1939 under several layers of cheesecloth sufficient to reduce the light intensity to 500 footcandles maximum during the natural period of flower-bud formation failed to flower or bloomed very sparingly. Plants prevented from flowering by high temperature and low light intensity failed to flower during the winter months, even when the proper

temperature was provided. Temperatures above 65° [F.] may not prevent flower-bud formation if light intensity is sufficient and the photoperiod correct. Low light intensity with correct photoperiod and temperature failed to produce flowers. Similar results were obtained with chrysanthemums and buddleias.

Effect of some spray materials on the apparent photosynthetic rate of the greenhouse rose, A. LAURIE and D. J. WITT. (Ohio Expt. Sta.). (Amer. Soc. Hort. Sci. Proc., 38 (1941), pp. 655-657).—All of several spray materials used caused a marked reduction in the rate of apparent photosynthesis the first day after application. The reduction persisted usually for at least 5 days before a gradual recovery took place. A second application of spray produced a similar but usually more drastic reduction than the first. Recovery, however, often occurred just as rapidly. No visible injury, either as scorching, chlorosis, or other manifestations, was observed from either one or two sprays.

Peat moss as a soil amendment for roses, R. C. ALLEN. (Cornell Univ.). (Amer. Soc. Hort. Sci. Proc., 38 (1941), pp. 687-689).—Well-rotted manure, imported peat moss, and cultivated reed peat were incorporated with the soil prior to the setting of 2-yr. hybrid tea roses propagated on multiflora roots. Peat moss was the only organic material which consistently improved the growth of the roses over a 3-yr. period. The greatest benefit in growth occurred during the first season. The slight difference in pH level between the soil plat and the soil-peat plat after the first few months was not believed sufficient to account for the growth differences. Nitrate nitrogen was much lower in the peat-soil plat than in the soil plat. Plants in the manure-soil plat performed poorly from the start, due apparently to the excessive amount of manure present.

FORESTRY

[Forestry studies by the Iowa Station]. (Partly coop. U. S. D. A.). (Iowa Sta. Rpt. 1941, pt. 1, pp. 132, 167-170, fig. 1).—Studies mentioned include those carried on by J. M. Aikman, G. B. MacDonald, A. L. McComb, and C. M. Genaux on tests of planting material of various species for control of erosion on hillsides; production of nursery trees for erosion control; mineral nutrition of woody plants on Tama, Lindley, and Clarion subsoils; and volume, growth, and yield studies for white oak in Iowa.

Legend for Society of American Foresters: Forest cover types for the eastern United States, L. H. REINEKE (U. S. Dept. Agr., Forest Serv., Northeast. Forest Expt. Sta. Occas. Paper 13 (1941), pp. [17], figs. 3).—A set of symbols is presented, with suggestions as to their use.

Retreating seed of black locust, C. E. HEIT (Farm Res. [New York State Sta.], 8 (1942), No. 2, pp. 11, 14, 17).—The author states that the majority of the lots of seed handled by the station in recent years have given only from 20- to 40-percent germination without treatment, and discusses various methods of increasing germination by overcoming the inherent hardness of seed coats. The most successful method was the immersion of seed in sulfuric acid, with a 1-hr. treatment in the acid at 75° F.

Selective cutting well adapted to spruce-fir forests, M. W. DAY (Michigan Sta. Quart. Bul., 24 (1942), No. 3, pp. 238-240).—Studies on plats established at the Dunbar Forestry Substation in second-growth stands of the spruce-fir type indicated that a selective method of cutting is well adapted to this forest type. The degree of cutting should be based upon several considerations, such as volume before cutting, the character and amount of reproduction present, the degree of exposure of the site, etc. Severe cutting resulted in an increase in undesirable species, such as aspen, and heavier losses from wind throw.

Very light cutting, on the other hand, failed to stimulate the rate of growth in the remaining trees or to permit the development of reproduction.

Rubber from rabbit brush (*Chrysothamnus nauseosus*), S. B. DOTEN (*Nevada Sta. Bul.* 157 (1942), pp. 22, figs. 4).—Discussing the possibilities of rubber production from this desert plant, the author describes its growth habits, location, varieties, methods of extracting rubber, quality of the rubber obtained, age at which the plants should be harvested, and various other factors involved in its utilization.

Missouri woods and wood-using industries, W. C. SECHRIST and R. H. PECK (*Missouri Sta. Bul.* 442 (1942), pp. 19, figs. 4).—Although Missouri uses five times as much lumber as is produced within the State, farmers and other small forest owners often are unable to dispose of home-grown forest products profitably owing to lack of information as to location of markets, species and specifications in demand, and prices available. The purpose of this survey is to provide marketing information to timber producers and to determine location of areas where present supplies of raw materials would appear to warrant establishment of new industries. Information was obtained from a total of 449 industries, including 150 sawmills and 38 stave mills. The two main topics taken up are uses of Missouri timber and commercial timber species and their uses, a directory of wood-using industries with the type of raw material used being included under the second of these headings. Examples of the questionnaires submitted to wood-using industries, sawmills, and landowners are appended.

Fuel wood used in the United States, 1630–1930, R. V. REYNOLDS and A. H. PIERSON (*U. S. Dept. Agr. Cir.* 641 (1942), pp. 20, figs. 4).—In connection with a general discussion of the important role that fuel wood has played in the development of the Nation, the authors present statistical information on fuel wood consumption by regions and decades from 1630 to 1930. At the present time, despite the extensive use of coal and other fuels, the quantity of wood used as fuel is still almost one-half of that at the peak of wood use. The preference by fuel cutters for young saw timber, primarily oak, is believed one reason why extensive stands of white oak saw timber and fine hickory and ash are no longer available where once they were abundant.

Fire Control Notes, [April 1942] (*U. S. Dept. Agr., Forest Serv., Fire Control Notes*, 6 (1942), No. 2, pp. 11+45–84, figs. 7).—In the usual form (*E. S. R.*, 86, p. 635), information is presented on fire prevention, fire-fighting plans and equipment, technics, etc.

DISEASES OF PLANTS

[Plant disease studies by the Delaware Station] (*Delaware Sta. Bul.* 235 (1941), pp. 33–38).—Brief reports (by T. F. Manns, S. L. Hopperstead, K. J. Kadow, M. W. Goodwin, and D. MacCreary) are given relative to the absence of the yellow-red virosis of peach (X-disease) from the State; and on studies of peach yellows and little peach, culture of bacterial spot of peach, control of sweetpotato wilt by chemical treatments, strawberry red stele control, spray injury on apples and peaches, ground spraying for apple scab, efficiency tests on sulfur sprays for apple scab, dinitro sprays for peach leaf curl, copper sprays compared for apple bitter rot control, and tests of the compatibility of inert dust carriers for copper fungicides and insecticides used in controlling cantaloup diseases.

[Plant disease studies by the Iowa Station] (*Iowa Sta. Rpt.* 1941, pts. 1, pp. 73, 120–123, 126–127, 129–131, 133–135, 166–167, figs. 2; 2, pp. 34–35, 41, 47–49, 54–58, fig. 1).—Brief reports by A. W. Welch, I. E. Melhus, H. C. Murphy, G.

Semeniuk, G. C. Kent, J. N. Martin, C. S. Reddy, E. L. Waldee, R. H. Porter, D. R. Shepherd, J. H. Standen, D. Lubberts, G. B. MacDonald, C. J. Drake, W. N. Rice, E. W. Lindstrom, W. E. Loomis, R. C. Eckhardt, and G. F. Sprague are included on (pt. 1) bacterial halo blight of bromegrass; breeding and selection of better disease-resistant strains of watermelons; parasitism of the smuts, rusts, and minor diseases of oats; propagation of disease-free sweet-potato seed stock; yellow dwarf and other onion diseases; apple scab and bacterial fire blight; influence of pythiaceous and other fungi on seedling stands of legumes and other crops; identification and control of diseases of small ornamentals and fruit tree stocks in Iowa nurseries; biology and control of nursery diseases of plants to be used in the prevention of soil erosion; diseases of potato seed stocks and their causal agents and control; progress in control of black stem rust of wheat by barberry eradication; cooperative white pine blister rust control; and (pt. 2) development of laboratory technics for detecting seed-borne pathogens of sorghum and corn; developing inbred lines of corn resistant to stalk and ear rots; genetic studies of bacterial wilt resistance in corn; factors influencing resistance of corn strains to *Ustilago zeae*; *Diplodia zeae* dry rot of corn; pathogenicity of *Basisporium gallarum* to corn; nature and methods of measuring disease resistance in corn; and findings in the plant disease survey in Iowa, 1940.

[Phytopathological papers] (*Iowa Acad. Sci. Proc.*, 48 (1941), pp. 133-157, 197, figs. 2).—The two papers, Diseases of Potatoes in Iowa, by I. E. Melhus, D. R. Shepherd, and M. A. Corkle (pp. 133-146), and The Earliest Known Epiphytotic of Rust in Iowa, by M. A. Corkle and I. E. Melhus (pp. 147-157) (both Iowa Expt. Sta.), and an abstract of the following are of phytopathological interest: The Relationship of Some Bacterial Plant Pathogens to the Coliform Bacteria, by E. L. Waldee (p. 197) (Iowa State Col.).

[Plant disease studies by the Maine Station] (*Maine Sta. Bul.* 405 (1941), pp. 408, 408-409, 482-497, 498-504, fig. 1).—Brief reports are included, by D. Folsom, R. Bonde, G. W. Simpson, M. T. Hilborn, B. E. Plummer, Jr., J. A. Chucka, A. Hawkins, F. Upton, A. F. Ross, F. J. Stevenson, and C. F. Clark, on work with wood rots of winter-injured apple trees and apple scab control; and on potato diseases, including spray tests with Cu fungicides plus rotenone for disease and insect control, spraying for late blight, comparison of Cu sprays, effect on yield of changing from a factory-made insoluble Cu spray to bordeaux mixture late in the growing season, effect of particle size on the fungicidal value of insoluble Cu fungicides against early and late blights, organic spray fungicides for late blight, use of oil as a carrier for Cu fungicides, internal mahogany browning of tubers, effect of low-temperature injury on value of seed tubers of the Chippewa and Katahdin varieties, seed treatment for controlling *Rhizoctonia* by the acidulated mercuric dip method (including varietal differences in susceptibility to injury, effect on yield and *Rhizoctonia* control of reducing the acid concentration of the solution, and HCl v. acetic acid for preparing the dip), bacterial ring rot control (including experimental plats for elimination of the disease, disinfection of cut seed and of containers and storage bins, and resistant varieties), tests for resistance to the leaf roll virosis, stem-end browning and net necrosis (including the effects of tuber maturity at harvest, soil type and fertility level, and rotations and fertilizer treatments on their development), chemical studies of stem-end browning, attempted inactivation of leaf roll virus in the tubers and tests for detecting it therein, ethylene chlorohydrin treatment of Cobblers, stem-end browning and net necrosis in storage and stem-end browning isolations and inoculations, and Green Mountain tuber-line seed plats in relation to viroses.

[Phytopathological studies by the Puerto Rico University Station] (*Puerto Rico Univ. Sta. Rpt. 1941*, pp. 5, 12, 37, 49-50, 54, 57, 62-64, 64-65, 65-67, figs. 2).—Reports of progress are included (by L. A. Alvarez, J. A. Bonnet, A. R. López, D. H. Cook, C. F. Asenjo, N. A. Schappelle, A. Riollano, F. J. Juliá, A. Roque, and J. Adsuar) on *Fusarium* root rot of coffee, mal de guaba disease, fertilizers in control of sugarcane chlorosis, determination and types of mosaic in sugarcane in Puerto Rico, virus disease complex in papaya, chemical relations in virus infected papaya plants, relation between the total contents of protein and papain in papaya, physiology of gumming disease of pineapple, leaf spot of strawberry caused by *Mycosphaerella fragariae*, development of a variety of cucumber resistant to mosaic and downy mildew, and mosaic-resistant peppers.

Department of botany (*Ontario Agr. Col. and Expt. Farm Ann. Rpt.*, 66 (1940), pp. 48-52).—Progress reports on the following studies are included: Spraying for tomato leaf spots and fruit rots; apple orchard spray tests; variety tests of oats for resistance to loose and covered smuts and of barley and wheat for resistance to loose smuts; incidence of powdery mildews on cereals; control of Mn deficiency of oats and barley by spraying; turnip brown heart control; and new and injurious diseases in Ontario (lettuce big vein, *Cercospora* leaf spot of privet, *Phomopsis juniperovora* blight of white cedars, *Phytophthora* fruit rot of tomato, and cedar-apple rust).

El reconocimiento de las enfermedades de las plantas cultivadas en Venezuela, 1937-1941 [Survey of the diseases of crop plants in Venezuela 1937-1941], A. S. MÜLLER (*Bol. Soc. Venez. Cien. Nat.*, 7 (1941), No. 48, pp. 99-113).—Annotated lists arranged by crop plants and by pathogens are presented.

[Plant disease work by the Saratov Agricultural Institute] (*Trudy Saratovsk. Selsk. Khoz. Inst. (Ann. Saratov. Agr. Inst.)*, 1 (6) (1939), pp. 176-203, fig. 1).—The following are included: Vilt, ili uvŭdanie donnika i liŭfŭerny (Wilt or Wilting of Sweetclover and Alfalfa), by M. N. Rodiĭĭn and P. A. Petrov (pp. 176-185); Redkie i maloizvestnye gribye bolezni saflora v povolzh'e [A Little Known and Rarely Met Fungus Disease of Safflower (*Oenothera lamarckiana*)] (pp. 186-190), and O redkoĭ bolezni tykvy i kalachkov vyzyvaemol *Ascochyta citrullina* (C. O. Smith) Gross (On Rarely Met Disease of Pumpkin and Muskmelons) (pp. 191-194), both by M. N. Rodiĭĭn; and Ėspol'zovanie nefteotkhodov v bor'be s chernym rakom plolovyykh derev'ev (The Use of Naphtha By-products in the Control of Black Cancer [Rot] of Fruit Trees) [*Sphaeropsis malorum*], by V. D. Musanov (pp. 195-203).

Plant quarantine: Report of the Central Committee appointed by the Australian Institute of Agricultural Science to deal with overseas plant quarantine, A. J. NICHOLSON et al. (*Jour. Austral. Inst. Agr. Sci.*, 7 (1941), No. 4, pp. 143-146).—This is a discussion of principles, with specific recommendations for regulations and methods of enforcement of a foreign plant quarantine system.

Insects and the spread of plant diseases, W. CARTER. (Hawaii. Pineapple Prod. Expt. Sta.). (*Smithson. Inst. Ann. Rpt.*, 1940, pp. 329-342, pls. 6).—This is a general treatment of the subject, including discussions of fungus, bacterial, and virus diseases, those due to insect feeding, the world-wide extent of the problem, how the insect acts as a carrier, the effects of climate and weather, control methods, and the outlook for the future.

Proceedings of local branches of the Society of American Bacteriologists (*Jour. Bact.*, 43 (1942), No. 2, pp. 265-272).—Abstracts of the following papers are of phytopathological interest: Isolation of Leaf Spot Bacteria From Soil, by S. Diachun, W. D. Valleau, and E. M. Johnson (pp. 271-272), and Breeding

Tobacco for Resistance to Mosaic, by W. D. Valleau (p. 272) (both Ky. Expt. Sta.).

Parasitism among the chytrids, J. S. KARLING (*Amer. Jour. Bot.*, 29 (1942), No. 1, pp. 24-35, figs. 47).—Of the nine previously reported cases of parasitism in these fungi, none attacks hosts of the same genus as the parasite, and only one occurs on a host of the same family. The author's infection experiments indicate *Rozella cladochytrii* to be more ubiquitous in host range, since it parasitizes three species each of *Cladochytrium* and *Nowakowskiella*, but does not attack monocentric rhizidiaceous chytrids or filamentous Oomycetes. *R. endochytrii* and *R. rhizophlyctii* n. sp. appear to be limited to *Endochytrium operculatum* and *Rhizophlyctis petersenii*, respectively. The taxonomy is discussed, *Pleolpidium* is reduced to the status of a synonym of *Rozella*, and a new genus, *Rozellopsis*, is proposed for the biflagellate, heterocont *Rozella*-like species previously reported in the literature.

A synopsis of Rozella and Rozellopsis, J. S. KARLING (*Mycologia*, 34 (1942), No. 2, pp. 193-208).—In the above paper some of the unsolved developmental, cytological, and systematic problems were noted. Here the author classifies the species in the light of present-day knowledge and brings them together from scattered sources in the literature (13 references).

Nota sinónimica: Tolyposporium senegalense es sinónimo de T. bullatum [Note on synonymy: *T. senegalense* as a synonym of *T. bullatum*], E. HIRSCHHORN (*Rev. Argentina Agron.*, 8 (1941), No. 4, pp. 384-386, pl. 1, fig. 1).—The former was described on *Pennisetum typhoidum* (= *glaucum*) and the latter on *Echinochloa crusgalli*.

Una especie de "Ustilago" nueva para la Argentina "Ustilago scitaminea" [*U. scitaminea*, a species of *Ustilago* new to Argentina], E. HIRSCHHORN (*Rev. Argentina Agron.*, 8 (1941), No. 4, pp. 326-330, figs. 2).—This smut is reported on sugarcane, and literature references to *Ustilago* spp. reported on the genera *Saccharum* and *Erianthus* are presented.

Localized injury to plant organs from hydrogen fluoride and other acid gases, L.-G. ROMÉLL (*Svensk Bot. Tidskr.*, 35 (1941), No. 3, pp. 271-286, figs. 2).—The origin of localized lesions from acid gases in smoke is discussed, and the idea of "corrosion" is refuted. A new case of primarily localized injury to leaves of maple and oak and apple and other fruit trees from HF in smoke is reported, and severe damage was noted from evaporating 0.001 molar HF solution. The border effect seen in leaves injured by HCl, HNO₃, or HF smoke is explained as due to an uneven uptake of acid gas in a distorted diffusion field, whereby a critical threshold is reached sooner along protruding edges. This phenomenon was studied in experiments with leaf models cut from indicator papers, and it is suggested that the method might be used in estimating the contents of certain acid gases in the air. An easily prepared hematin lake paper was found to give a sensitive and specific reaction for HF in the air. There are 38 references.

Role of the dosage-response curve in the evaluation of fungicides, A. E. DIMOND, J. G. HORSFALL, J. W. HEUBERGER, and E. M. STODDARD (*Connecticut [New Haven] Sta. Bul.* 451 (1941), pp. 631-667, figs. 16).—Among the new concepts arising from the testing of fungicides in the station laboratory are the following: Field tests can profitably be patterned more closely after the design of current laboratory tests. In the laboratory, a fungicide is tested at a number of dosages, and data are obtained on the spore inhibition by each. Plotting of these dosage-response data on a logarithmic probability grid usually yields straight lines, but there are two notable exceptions, viz, that in which the dosage-response curve consists of two or more linear segments, the whole

curve constituting a broken line, as noted by McCallan, Wellman, and Wilcoxon (E. S. R., 86, p. 340), and dosage-response curves exhibiting peaks of toxic action, as here shown. Both are explained by the hypothesis that the toxicant dissociates (or associates) in water and that the dissociated molecule has a toxicity differing from that of the undissociated molecule. Fundamental properties of fungicides derivable from the linear type of dosage-response curve are the LD-95 or LD-50 (i. e., the lethal dosage for 95 or 50 percent of the treated spores), and the slope of the dosage-response curve. The latter value should be included in evaluating fungicides. LD-95 values are affected by the fungicide, fungus species, age of culture, and spore load, as well as by the slope itself. Slope may be affected by the fungus used and is increased by any environal factor tending to bring the fungus nearer its optimum. With all other factors constant, it is also a property of the fungicide.

The slope of the dosage-response curve gives an indication of the importance of tenacity. In general, fungicides performing under such conditions that their dosage-response (or dosage-control) curves are flat need not have such high tenacity values as when the slopes are steep. Properties of a good fungicide include low LD-95 and LD-50, flat dosage-control and dosage-response curves, or, if this curve is steep, high tenacity. The assumption is made that there is a homology between laboratory and field conditions for fungicide tests, and the supporting evidence is discussed. It is shown that the efficiency of fungicidal action may be markedly improved by more effective coverage of the plant. Often in repeated tests using two fungicides, one material will perform better in some cases and will be inferior in others. This is explained by assuming that the reversal effect is due to the crossing-over of dosage-control curves and to the differential shift in slope of these curves with changing environment. It is suggested that in field tests fungicides may be more quantitatively compared by measuring the dosage of each required to effect the same level of disease control, rather than by measuring the levels of disease control obtained by applying single fungicide dosages. This involves applying each fungicide in a dosage series. There are 22 references.

Meeting the spray material shortage, N. TURNER and J. G. HORSFALL (*Connecticut [New Haven] Sta. Bul. 455 (1942), pp. 169-179*).—The suggestions here made involve the availability and conservation of materials, accurate diagnosis of troubles, selection of important crops and elimination of unnecessary treatments, dosage, improved coverage and timing of applications and of planting, alternate materials, and machinery.

Substitutes for copper and zinc in fungicidal sprays, J. W. ROBERTS. (U. S. D. A.). (*Amer. Chem. Soc. Mtg., 102 (1941), Abs. Papers, pp. 12A-13A*).—An abstract.

Pythium arrhenomanes on cereals and grasses in the northern Great Plains, T. C. VANTERPOOL and R. SPRAGUE. (U. S. D. A., N. Dak. Expt. Sta., et al.). (*Phytopathology, 32 (1942), No. 4, pp. 327-328*).—Isolates of *P. arrhenomanes*, a fungus both native and prevalent in North Dakota, and obtained from 33 species and 16 genera of the grass family, proved moderately to severely parasitic to wheat seedlings on inoculation. *P. debaryanum* and several related species were isolated from damped-off or necrotic grasses and to some extent later, following rainy periods. Many of these sphaerosporangial forms were slightly to moderately pathogenic on wheat, but others showed no signs of parasitism. *P. aristosporum*, isolated twice from wheat and barley, reacted similarly to *P. arrhenomanes*.

Seed disinfection.—IV, Loss of vitality during storage of grain treated with organo-mercury seed disinfectants, C. C. BRETT and W. A. R. DILLON

WESTON (*Jour. Agr. Sci. [England]*, 31 (1941), No. 4, pp. 500-517, pl. 1).—Continuing this series (*E. S. R.*, 77, p. 57), the majority of the experiments here reported were confined to wheat, and indicated that seed of high germinability, average moisture content, sound physical condition, dusted as recommended, and stored in envelopes or jute bags under satisfactory conditions did not lose vitality to any greater extent than untreated seed under 1 year's storage. Trials with wheat, barley, and oats showed that the moisture content of the seed and the storage conditions materially influence losses, relatively high humidity and fluctuating temperatures leading to rapid loss in both treated and untreated seed and high moisture content of the seed only enhancing these adverse results. The phytocidal effects of organomercury dusts were more pronounced for wheat, less for oats, and least for barley. Storage of treated seed wheat in closed containers led to very rapid loss of germinability, whereas untreated seed under these conditions retained a high germinability for well over a year. Important in overdosing was the variation in maximum amount of the different proprietary dusts tested which could be held by well-conditioned grain. Superficially moist seed retained dusts at rates much above those recommended, in such cases leading to retardation and reduction in germinability and to increased phytocidal effects.

Foot-rot of gram (*Cicer arietinum* L.) caused by *Operculella padwickii* nov. gen., nov. spec., K. F. KHESWALLA (*Indian Jour. Agr. Sci.*, 11 (1941), No. 2, pp. 316-318, pl. 1).—A pycnidial fungus causing foot rot of gram (chickpea) in the Punjab is described as *O. padwickii* n. gen. and sp. (Sphaeropsidaceae).

Determination of resistance to the blight disease [*Mycosphaerella rabiei* Kovacevski=*Ascochyta rabiei* (Pass.) Lab.] in gram types, J. C. LUTHRA, A. SATTAR, and K. S. BEDI (*Indian Jour. Agr. Sci.*, 11 (1941), No. 2, pp. 249-264).—In varietal resistance tests on 392 types and collections of gram (chickpea) from India and other countries, all Indian types were susceptible to the disease but three "foreign" types proved highly resistant and have remained so under different environal conditions.

Manganese deficiency and accumulation of nitrates in plants, G. W. LEEPER (*Jour. Austral. Inst. Agr. Sci.*, 7 (1941), No. 4, pp. 161-162).—Oats were grown in soil on which the Mn-deficiency symptom known as "gray speck" appeared. Tested by the diphenylamine- H_2SO_4 method for nitrates, every oats plant exhibiting marked symptoms of Mn deficiency gave an intense reaction for nitrate, whereas plants grown on soil successfully treated with $MnSO_4$ to overcome gray speck showed no trace of nitrate. Similar results were obtained with canary grass (*Phalaris minor*). The nitrate in the soil at the time was less than 1 p. p. m. of N.

Rice disease investigations: Root rot studies, T. C. RYKER and W. A. DOUGLAS. (La. Expt. Sta. and U. S. D. A.). (*Rice Jour.*, 44 (1941), No. 12, pp. 9-10, 11).—In pot tests inoculated with *Pythium* and root maggots (*Lissorhoptrus simplex*) separately and together, the fungus alone proved only slightly or not at all parasitic and the root maggots alone induced considerable injury, but the severest damage occurred with both together. Field studies indicated that both were associated with root rot, but that either alone might occur without the root trouble. This pointed to a possible secondary role of environal factors. Two years' study indicated that both high soil temperature and low fertility favored the disease, and that beneficial effects followed the use of fertilizers, especially when coupled with drainage.

Artificial production of ergot, H. J. HYNES (*Agr. Gaz. N. S. Wales*, 52 (1941), No. 11, pp. 571-573, 581, figs. 4).—Owing to the current shortage in ergot, efforts over two seasons have been made to develop artificial production methods in New South Wales. Results thus far appear to indicate that a high-quality

product can be produced, the chief limiting factor being the uncertainty of weather conditions at the time rye comes into flower. The project is still in the experimental stage, but commercial possibilities are said to be promising for the cooler, moister localities.

Varietal resistance to foot-rots in wheat, H. C. FORSTER and R. D. CHOLL (*Jour. Austral. Inst. Agr. Sci.*, 7 (1941), No. 3, pp. 121-123).—The very widespread incidence of the disease group classed as foot and root rots is believed to make it one of the most serious wheat troubles in Victoria. The observations presented render it evident that some degree of varietal resistance occurs, and that even if impossible to obtain varieties possessing complete resistance it should be practicable to utilize the more resistant types to breed wheats having at least a considerable tolerance to the trouble.

The effect of stem rust on the yield, quality, chemical composition, and milling and baking properties of Marquis wheat, F. J. GREANEY, J. C. WOODWARD, and A. G. O. WHITESIDE (*Sci. Agr.*, 22 (1941), No. 1, pp. 40-60).—In 100 plats ($\frac{1}{400}$ acre each) of Marquis wheat, those without sulfur dusting became heavily infected with stem rust, whereas a wide range occurred in the treated plats during 1934, 1935, and 1937, and stem rust alone or plus leaf rust markedly affected yield, kernel weight, and commercial grade. Reductions in grain yield and quality were always in proportion to rust infection, but of the various agronomic factors studied, kernel weight was the most accurate index of stem rust injury. In all 3 yr. the protein content of the grain decreased with increase in rust. The P, Ca, and ash content of the grain were not significantly affected by rust in 1934-35, but in 1937 all three increased with increase in stem rust. In contrast to the grain, the protein and P contents of the straw increased, whereas the Ca and ash decreased with increase in stem rust infection. Milling and baking tests indicated that an increase in stem rust was always associated with a decrease in yield of straight grade flour, loaf volume, crumb color, and crumb texture score. The carotene content (flour color) increased with increase in stem rust severity, and in all 3 yr. rust decreased the milling value of the wheat. There are 31 references.

Rust-resistant wheats for Egypt, J. PHILP and A. G. SELIM (*Nature [London]*, 147 (1941), No. 3720, p. 209).—Results of experimental work in breeding for the three rusts prevalent in Egypt are said to resemble those of Mehta and Pal in India (*E. S. R.*, 85, p. 71). The greatest loss in the Delta region is from stem rust. Its physiologic races have not been determined, but appear to be the same as in India. Details of the work are briefly summarized. The discovery of resistant *Triticum vulgare* strains has simplified the problem, and good progress has been made toward production of a resistant variety of wheat suited to Egyptian conditions.

Dry sheath-rot of abacá caused by Marasmius and suggestions for its control, M. M. RAMOS (*Philippine Jour. Agr.*, 12 (1941), No. 1, pp. 31-41, pls. 3).—This disease of Manila hemp is said to have been gaining a foothold in most of the neglected fields of the Philippines. The fungus lives primarily in the soil but penetrates the host through the corms and pseudostem, affected plants becoming pale and stunted. Numerous pure-culture infections were obtained, and all varieties tested proved susceptible. The pathogen is similar if not identical to *M. semiustus*, which causes stem and root rot of banana. Being a facultative saprophyte, sanitary measures are advised, together with roguing of diseased plants, proper distancing, clean culture, and use of disease-free rootstocks and suckers for propagation. There are 19 references.

Some responses of the bean plant to chlorate and perchlorate ions, R. J. WEAVER (*Plant Physiol.*, 17 (1942), No. 1, pp. 123-128, figs. 2).—The chlorate ion

was less toxic to Biloxi soybeans than the perchlorate. Symptoms of chlorate injury were a brown spotting and gradual death of the leaves, progressing from older to younger. Perchlorate often killed the leaflet tips, normal leaf expansion was prevented, terminal growth was retarded, and shoots arose from the axils of the cotyledons and leaves. Chlorate was less toxic in water culture than in sand, but the reverse was true for perchlorate.

Mosaic of *Bromus inermis*, H. H. MCKINNEY, H. FELLOWS, and C. O. JOHNSON. (U. S. D. A.). (*Phytopathology*, 32 (1942), No. 4, pp. 336-337).—Studies of a yellow mosaic virus from *B. inermis* at Manhattan, Kans., indicated it to be inoculable also to wheat and oats and to be distinct from the seven wheat viruses previously tested (E. S. R., 78, p. 205).

Notes on diseases affecting maize in the Philippines, G. M. REYES (*Philippine Jour. Agr.*, 12 (1941), No. 1, pp. 61-71, pls. 6).—The following corn diseases are discussed: Downy mildew (*Sclerospora philippinensis*), brown spot (*Physoderma zae-maydis*), pokkah boeng disease (*Fusarium* associated), dry ear rot (possibly due to *Physolepora zeicola*=*Diplodia frumenti*), anthracnose (*Colletotrichum* sp.), and banded sclerotial disease (*Rhizoctonia solani*).

The relation of mineral nutrition to seedling blight infection in maize, E. T. EDWARDS (*Jour. Austral. Inst. Agr. Sci.*, 7 (1941), No. 4, pp. 147-154, fig. 1).—Observations on 7,200 corn seedlings of two varieties grown at two temperatures and five levels of N, P, and K supply indicated that their reactions to infection with *Gibberella fujikuroi* or its variety *subglutinans* were not modified by any of the nutrient treatments. From other tests it also appeared that the corn grain contains sufficient reserves of essential mineral nutrients to maintain seedling growth for several weeks after germination, and consequently the seedling during its early growth stages is largely if not entirely independent of external sources of such elements. Furthermore, since the early seedling stages present the critical period for infection with these fungi it seems unlikely that soil fertility plays any role in the development of these seedling blights.

Estudo sobre a fusariose do algodoeiro [Fusarium wilt of cotton], F. R. MILANEZ and J. JOFFILY (*Rodriguésia*, 5 (1941), No. 14, pp. 325-352, pls. 9; *Eng. abs.*, pp. 347-349).—This investigation of the disease due to *F. vasinfectum* includes studies of the morphology and life history of the fungus and of the pathogenesis and histopathology of infection in the host plant. Some evidence is presented that the fungus can use paraffin oil as a source of C and of energy, and the possible diagnostic value of this character is suggested. There are 38 references.

Some factors influencing the utilization of inorganic nitrogen by the root rot fungus, P. J. TALLEY and L. M. BLANK. (Tex. Expt. Sta. coop. U. S. D. A.). (*Plant Physiol.*, 17 (1942), No. 1, pp. 52-68, fig. 1).—Growth of *Phymatrichum omnivorum* with NH_4 as the only N source in the nutrient solution resulted in the development of acidity, whereas nitrate utilization resulted in a more alkaline reaction. Adding CaCO_3 , MgCO_3 , or Na_2CO_3 permitted good growth with NH_4 nitrogen by delaying the development of critical acidity. There was apparently no toxicity of NH_4 per se in a properly constituted and balanced nutrient solution, and if these conditions are met it is an excellent N source. Growth with nitrate N was influenced by the balance between K and Mg. Ca can be substituted for Mg to a limited extent, and Na can partially replace K in this antagonistic action. NH_4 utilization is influenced by the ionic balance. There are significant and favorable growth reactions with high Mg and high PO_4 and with high Ca or Na and high SO_4 or Cl on the utilization of NH_4 . There is a contrasting unfavorable growth reaction with high Mg when accompanied by high SO_4 or Cl. The fungus grew when all its N was supplied as nitrite, and no evidence of nitrite toxicity was observed.

Cottonseed treatment in Mississippi, J. A. PINCKARD (*Mississippi Sta. Cir.* 103 (1942), pp. 7, figs. 4; also in *Miss. Farm Res.* [*Mississippi Sta.*], 5 (1942), No. 3, pp. 4-5, figs. 4).—This is a general discussion of cottonseed treatment for various seed-borne diseases, including an account of its development in Mississippi over a period of years, with directions as to fungicides and methods and apparatus for seed treatment.

Effect of borax applications on the incidence of rust on flax, H. G. HEGGENESS. (Minn. Expt. Sta.). (*Plant Physiol.*, 17 (1942), No. 1, pp. 143-144).—A preliminary report on tests showing promise of *Melampsora lini* control by borax applications. Applied in solution at the rate of 60 lb. per acre 2 weeks after germination, some burning of the leaf tips occurred.

Marsh spot of peas: A manganese deficiency disease, C. S. PIPER (*Jour. Agr. Sci. [England]*, 31 (1941), No. 4, pp. 448-453, pl. 1).—Studying the effects of this deficiency in water cultures, complete absence of Mn was found to produce a mottling of the younger leaves and death of the growing tip, the plant not reaching the flowering stage. Small amounts of Mn, insufficient for normal requirements, permitted increased growth and seed formation, the seeds showing marsh spot lesions, the severity of which depended on the relative lack of this element. The trouble results from a partial Mn deficiency, the amount available being sufficient for normal vegetative growth but not for healthy seed production.

Pea wilts and root rots, J. C. WALKER and W. C. SNYDER (*Wisconsin Sta. Bul.* 424, rev. (1942), pp. 16, figs. 5).—This is a revision of the bulletin previously noted (E. S. R., 69, p. 533).

Nota sobre a verrugose do amendoineiro [Note on peanut verrucosis], A. S. COSTA and O. F. DE SOUZA (*Biologico*, 7 (1941), No. 12, pp. 347-349, pl. 1).—The symptoms of this peanut disease due to *Sphaceloma arachidis* are described and the reactions of 45 numbers in a varietal collection are tabulated, several proving resistant and one apparently immune.

Uma molestia de virus do amendoim (*Arachis hypogaea* L.): A mancha anular [A virus disease of peanut (*A. hypogaea*): Ring spot], A. S. COSTA (*Biologico*, 7 (1941), No. 9, pp. 249-251, pls. 2).—The symptoms are described and illustrated. Symptomatically the disease is said to resemble one reported from Africa as due to *Arachis virus* 1. Preliminary cross inoculation tests on tobacco, using the rubbing method, gave negative results. Thus far no insect vector has been found, and no infection has followed in seed transmission tests.

Increased yields of Spanish peanuts obtained by dusting, N. C. WOODBROOK (*Georgia Sta. Cir.* 136 (1942), pp. 4, fig. 1).—Five-year tests are said to have shown that substantial increases in yields of nuts and hay may be obtained by use of dusting S to control leaf spots. Other dusting materials have shown promise but need further trial. Sulfur may also be used for leaf spot on North Carolina Runner peanuts, but the first application is made a week or two later than for the Spanish variety.

Estudios sobre o estado sanitario de algumas variedades de batatinhas peruanas [Studies of the sanitary state of some Peruvian potato varieties], N. R. NOBREGA and K. SILBERSCHMIDT (*Biologico*, 7 (1941), No. 9, pp. 243-248, pls. 2; *Eng. abs.*, p. 248).—Plants arising from tubers of 10 potato varieties collected in native Peruvian markets exhibited no symptoms of virus infections, though by plant juice inoculations 4 of the varieties were found to harbor viruses. That from the Serrana negra variety seemed to resemble the potato Y virus; the one from the Mamada, Rosa, and Huanabana varieties was related to the potato X virus group.

Staining scab *Actinomyces* in aerial potato parts, H. E. WHEELER and B. F. LUTMAN. (Vt. Expt. Sta.). (*Stain Technol.*, 17 (1942), No. 1, p. 41).—A modification of a method described in an article previously noted (E. S. R., 85, p. 362).

A "perna preta" da batatinha [Potato blackleg], M. KRAMER (*Biologico*, 7 (1941), No. 12, pp. 350-353, figs. 3).—A note on *Erwinia phytophthora* infection of stems and tubers and on control procedures.

Bacterial ring rot of potatoes, J. R. VAUGHN and J. G. LEACH (*West Virginia Sta. Cir.* 77 (1942), pp. [7], figs. 2).—An informative circular on the disease and its control.

Notas phyto-sanitarias.—III, O *Synchytrium endobioticum* (Schilb.) Percival (A "sarna preta" da batatinha) [Phytosanitary notes.—III, *S. endobioticum* potato wart], H. S. LEPAGE and L. I. GONÇALVES (*Bol. Agr. [São Paulo]*, 40. ser., 1939, pp. 216-228, figs. 4).—This is a general account (12 references), discussing and mapping the world distribution of the disease, the biology of the fungus, environal influences, dissemination, control, and resistant varieties, with lists of susceptible German and Dutch varieties.

The potato eelworm, S. B. DOREN (*Nevada Sta. Bul.* 158 (1942), pp. 7, fig. 1).—This is an informatory leaflet on *Heterodera marioni*, a destructive pest of potatoes in California and Nevada, based on a survey of the situation (coop. U. S. D. A.) in 1941, with conclusions as to control methods and the potato and eelworm in wartime.

Strength of mercuric chloride solutions in the treatment of seed potatoes (*Maine Sta. Bul.* 405 (1941), pp. 424-425).—This work by E. R. Tobey and B. E. Plummer, Jr., substantiated previous results indicating the value of hydrochloric and acetic acids in the dipping solutions.

Studies on the histology and colouration of the pericarp of the sorghum grain, G. N. RANGASWAMI AYYANGAR and N. KRISHNASWAMI (*Indian Acad. Sci. Proc.*, 14 (1941), No. 2, Sect. B, pp. 114-136, pls. 2, figs. 2).—From studies of the histology and development of the pericarp in wild and cultivated species of sorghum, the former were found characterized by a very thin pericarp consisting of epidermis and tube cells only, sometimes a very small mesocarp tissue, an integument always, and brown color. The cultivated sorghums had similar layers but more of them, and the grains consisted of two main groups—starchy and nonstarchy. The integument was present in some grains and not in others, and the grains with integument were usually brown. Further details are given.

Savoy disease of sugar beets in southwestern Ontario, A. A. HILDEBRAND and L. W. KOCH (*Phytopathology*, 32 (1942), No. 4, pp. 328-331, figs. 2).—This disease, transmitted by the pigweed bug (*Piesma cinerea*) is reported for the first time from Ontario. Though widespread in occurrence, surveys (1941) revealed it to be economically significant in only one locality where, in limited areas, infection reached a maximum of 6.5 percent. In general, the incidence did not exceed an average of 2.1 percent. Circumstantial evidence suggested that weeds growing near the fields may harbor the virus, which was transmitted to the beets following invasion of the beet rows by viruliferous insects.

Downy-mildew disease of sugar cane and other grasses, C. W. LEECH (*Queensland Bur. Sugar Expt. Stas. Tech. Commun.* 5 (1941), pp. [2]+111-135, figs. 13).—This is a general review (55 references) and discussion of the *Sclerospora sacchari* mildew of sugarcane, its history and geographical distribution, symptoms, transmission, and alternate hosts. Included were investigations of the relations of this fungus to various crop and grass plants. Among these, sorghum proved fairly resistant but Johnson grass and Sudan grass gave indica-

tions of being able to serve as alternate hosts, whereas nine other species of the grass family failed to become infected. Transmission from corn to sugarcane was effected under controlled conditions.

Blue mold of tobacco and its control (*N. C. Agr. Col. Ext. Cir. 229, rev. (1939), pp. 19, figs. 8*).

On the size and shape of the tobacco mosaic virus protein particle, V. L. FRAMPTON. (Cornell Univ.). (*Science*, 95 (1942), No. 2461, pp. 232-233, fig. 1).—This is a brief review of some previous work by others on particle size of this virus protein and presentation of results obtained by measurements made on electron microscope photographs, the curve showing a bunching at lengths in the regions of 300, 190, 150, 100, and 37 $m\mu$ (essentially in the ratio of 8:5:4:3:1). It is noted that the implications of the orderliness indicated are obvious.

The reversible inactivation of tobacco mosaic virus by crystalline ribonuclease, H. S. LORING (*Jour. Gen. Physiol.*, 25 (1942), No. 3, pp. 497-505, figs. 2).—Studies of the effects of time of standing on the amount of inactivation and of dilution and repeated high speed centrifugation on recovery of virus activity, and the preparation of an insoluble virus-enzyme complex, indicate that the inactivation is effected at least in part by a combination between virus and enzyme. The significance of the fact that ribonuclease has no detectable effect on the virus nucleic acid when the latter is in combination with protein in the form of virus is discussed with respect to the virus structure.

The effect of tobacco-mosaic virus on cellular respiration, M. W. WOODS and H. G. DuBUY. (Md. Expt. Sta.). (*Phytopathology*, 32 (1942), No. 4, pp. 288-302, figs. 6).—"Oxygen respiration in healthy Turkish tobacco leaves is accomplished by both cyanide-sensitive and cyanide-resistant systems of catalysts. The energy for protoplasmic streaming is derived from these respiration catalysts. Rate of streaming can be used as an index to cellular respiration. There are two cyanide-sensitive systems, separable from each other by means of their 'critical oxygen tensions'; these have been arbitrarily designated as the A and B systems. The third or 'C system' is resistant to cyanide and continues to function at higher oxygen tensions than either the A or B components during progressive suffocation. Infection with tobacco mosaic virus (*Marmor tabaci* H.) results in an inhibition in the A system 48 to 72 hr. after infection of the cell. The B system apparently is not affected, but the C component is greatly increased in activity following inhibition of the A component. The inhibition of the A system apparently occurs only after development of a high concentration of virus, and such inhibition of certain respiratory components may be the factor preventing further multiplication of the virus protein." There are 22 references.

Some effects of iodine and other reagents on the structure and activity of tobacco mosaic virus, M. L. ANSON and W. M. STANLEY (*Jour. Gen. Physiol.*, 24 (1941), No. 6, pp. 679-690).—Denatured tobacco mosaic virus has a number of SH groups corresponding to its total S content of 0.2 percent, and these groups were estimated by methods described. The SH groups of the virus or their precursors can be abolished by reaction of the native form of the virus with I. Virus whose SH groups have been oxidized beyond the S-S stage by I but whose tryptosine groups have not been converted into diiodotyrosine groups still retains its normal biological activity. Inoculation of Turkish tobacco with active virus whose SH groups have been abolished by I results in producing a virus with the normal number of SH groups. If enough I is added to the mosaic virus or if the I reaction is carried out at a sufficiently high temperature, then the tyrosine groups are converted into diiodotyrosine groups and the virus is inactivated. Tobacco mosaic virus can be almost completely

inactivated by iodoacetamide under conditions where the latter reacts with few if any of the protein's SH groups. The virus is not inactivated by dilute *p*-chloromercuribenzoate. There are 23 references.

Cultural measures for control of root-knot eelworm, with special reference to tobacco, R. W. JACK (*Rhodesia Agr. Jour.*, 38 (1941), No. 10, pp. 546-559, pl. 1).—This is a general article summarizing information (16 references) on *Heterodera marioni*, such as symptoms of attack, life history, environal relations, host plants, and measures against it (preventive and pulliative), and including data on researches and experiences in South Africa. It is concluded that it cannot be eradicated from cultivated lands and that control by chemicals is under most conditions uneconomic. Partial control by culture practices is advocated as the only practicable procedure.

Vegetable seed treatments, R. J. HASKELL and S. P. DOOLITTLE (*U. S. Dept. Agr., Farmers' Bul.* 1862, rev. (1942), pp. II+17, figs. 4).—This is a revised edition (*E. S. R.*, 85, p. 360).

Certain ornamentals may carry virus diseases to truck crops, F. P. MCWHORTER. (*Oreg. Expt. Sta. coop. U. S. D. A.*). (*Oreg. State Hort. Soc. Ann. Rpt.*, 33 (1941), pp. 47-50).—The choice of ornamentals for plantings about the home may have a direct relation to virus disease control in nearby truck crops. This situation is discussed, with examples showing the need to avoid those which are incompatible to truck crops from this standpoint.

Root-knot, J. A. PINCKARD (*Mississippi Sta. Cir.* 104 (1942), pp. 4, fig. 1).—An informatory leaflet on the root knot nematode and its control, with special reference to the victory garden program of the United States.

Fusarium wilt of cantaloupe and studies on the relation of potassium and nitrogen supply to susceptibility, D. L. STODDARD. (*Univ. Md.*). (*Peninsula Hort. Soc. [Del.] Trans.*, 55 (1941), pp. 91-93).—This is a preliminary report on sand culture tests from which it was apparent that there is a ratio of K to nitrate at which wilt due to *F. bulbigenum nircum* can be reduced, with a confirmatory result on a commercial field for which a high-K fertilizer had been used.

Are some of our cantaloupe troubles caused by nutrient deficiencies rather than by diseases, H. L. STIER. (*Univ. Md.*). (*Peninsula Hort. Soc. [Del.] Trans.*, 55 (1941), pp. 88-90).—This is a brief summary of sand culture experiments on the effects of deficiencies in N, P, K, Ca, Mg, B, Mn, S, and Fe, and on the interaction of N, K, Ca, and Mg.

Una nueva especie de hongo: "Rhinotrichum griseo-roseum n. sp." [A new species of fungus: *R. griseo-roseum*], J. B. MARCHIONATTO (*Rev. Argentina Agron.*, 8 (1941), No. 4, pp. 277-280, pl. 1, figs. 2).—The new fungus described parasitizes lesions of *Cercospora capsici* on the lower leaf surfaces of *Capsicum* sp.

A convenient scale for use in the rapid determination of comparative degrees of infection of hops by the downy mildew fungus, Pseudoperonospora humuli, G. R. HOERNER. (*Oreg. Expt. Sta. coop. U. S. D. A.*). (*Phytopathology*, 32 (1942), No. 4, pp. 331-333, figs. 3).—Using the scale described, numerical values are rapidly assigned to the degrees of infection appearing on hop leaves inoculated with *P. humuli*.

Progress on control of anthracnose spot of honeydew melons in storage is made, W. A. KREUTZER and D. P. GLICK (*Colo. Farm Bul. [Colorado Sta.]*, 4 (1942), No. 1, pp. 9-11, figs. 2).—Preliminary results in controlling *Colletotrichum lagenarium*, though not believed to justify sweeping conclusions, were clear enough for making certain tentative recommendations: Shippers of Colorado honeydew melons should continue use of Cl in their wash tanks, any commer-

cial Na or Ca hypochlorite being suitable for properly chlorinating both wash water and the conveyor belts, found to be the chief source of infection. Prevention of injuries to the melons is another point almost as important, and, finally, sorting out and discarding of even slightly diseased melons should be done prior to washing. In case Cl becomes unavailable, the last operation should be carried out with great care and every precaution exercised against mechanical injuries.

Curly top, the most serious menace to tomato production in Utah, H. L. BLOOD. (Coop. U. S. D. A.). (*Farm and Home Sci. [Utah Sta.]*, 3 (1942), No. 1, pp. 8-9, 11, figs. 4).—This is a general discussion of present knowledge on the curly top virosis as it affects tomato growing, and a progress report on research work through which it is believed that early developments in control may combine the use of partially resistant tomato strains in a closely spaced field planting plan with standard culture practices that will maintain maximum vigor and productivity. Development of higher resistance through interspecific hybridization and selection is in progress and holds great promise for the future, but considerable time will be required before results are ready for commercial application.

Difference in pH relations of some pathogenically variable strains of tomato *Fusarium*, F. L. WELLMAN. (U. S. D. A.). (*Phytopathology*, 32 (1942), No. 4, pp. 271-287, figs. 2).—Strains (79) of tomato wilt *Fusarium* differing in pathogenicity also differed in physiology, as indicated by pH relationships and relative growth. In fluid culture a highly virulent strain produced its maximum weight in 12 days, a mild strain in nearly twice this period. The former produced the greater weight in fluid culture, but on agar the mild strain covered the greater area. In fluid media the maximum growth of the virulent strain was produced only around pH 4, and of the mild strain only around pH 8. On agars both had approximately equal maximum points at slightly above neutral. In series of fluid media with wide pH ranges, cultures inoculated with mixed mild and virulent strains produced maxima at two points, as did cultures inoculated with actively saltating, unstable strains. The virulent and mild strains changed the original pH reactions in different degrees. The studies rendered it evident that under parallel conditions virulent strains produced most alkalinity, mild ones most acidity, and those of intermediate pathogenicity developed reactions between the extremes. A new differential agar medium made it possible to separate with greater ease the variant culture types of the *Fusarium* strains used.

The performance of the Pan America tomato on *Fusarium* wilt infested soil, C. E. COX. (Univ. Md.). (*Peninsula Hort. Soc. [Del.] Trans.*, 55 (1941), pp. 84-85).—In the tests on soil severely infested with *F. bulbigenum lycopersici* here reported, Pan America far exceeded in yield that of the Brown Special and Rutgers varieties, and it is believed to be the most wilt-resistant commercial variety now available.

Comparison of sprayed tomato plants as seedlings in Georgia and Ohio, J. D. WILSON and W. D. MOORE. (Coop. U. S. D. A.). (*Ohio Sta. Bimo. Bul.* 214 (1942), pp. 17-25).—Ohio observations on both injurious and beneficial effects of certain spray materials applied to young tomato plants led to a 3-yr. study of how these effects might carry over on plants grown to maturity in Ohio fields and how southern- v. northern-grown plants might compare under these treatments. Bordeaux and several of the fixed copper spray materials were used, and data were collected on plant injury and mortality, ripening dates, occurrence and severity of certain common diseases, and on the quantity of green fruit left after harvest. The comparative yields of all trials, considered as a

group, showed the balance to favor the southern-grown plants slightly. Bordeaux gave excellent control of foliage diseases but injured the plants in the seedling stage, so that yields from such plants were sometimes less than from the untreated controls and frequently less than from those receiving the fixed coppers. Almost no significant yield differences were noted for the last group in the eight comparisons made, and with one exception there was no spray injury. In general, the better the foliage diseases were controlled, the more green fruits were left on the plants after harvest had ended. Preshipment spray tests with the southern-grown seedlings suggested that bordeaux should not be applied for several days before pulling and that the fixed coppers should not be applied too near the shipping date. The general conclusion is that southern-grown plants properly sprayed, packed, and shipped are potentially capable of producing as large a crop of tomatoes as Ohio-grown plants.

Combined sprays for late tomatoes, W. L. MORGAN and P. C. HELY (*Jour. Austral. Inst. Agr. Sci.*, 7 (1941), No. 4, pp. 158-161).—For the regular weekly spraying of the late tomatoes in the Mangrove Mountain-Kulnura area of Australia, a satisfactory fungicide for combined sprays was found to be weak bordeaux (1-1-40). Strong bordeaux reduced yields through spray injury, whereas copper oxychloride, though causing no injury, was less effective against *Alternaria solani* early blight. The weak bordeaux plus lead arsenate (3 lb. to 40 gal.) added for the fruit caterpillar (*Heliothis armigera*) control and nicotine sulfate (1-400) as required for aphids gave the highest yields of marketable fruit.

Experiments on the control of cherry leaf-spot, 1939-1941, S. M. ZELLER, C. E. OWENS, and A. W. EVANS. (Oreg. Expt. Sta.). (*Oreg. State Hort. Soc. Ann Rpt.*, 33 (1941), pp. 56-58).—A brief summary of experimental results with S, Cu, and organic sprays.

The rasp leaf of cherry, E. W. BODINE and J. H. NEWTON. (Colo. Expt. Sta. et al.). (*Phytopathology*, 32 (1942), No. 4, pp. 333-334, fig. 1).—First observed in Royal Ann cherry trees in western Colorado (1935), the disease in question is characterized by enations or elongated protuberances on the lower and by depressed rugosities of lighter-than-normal color on the upper leaf surfaces. Severely affected leaves are small, narrow, and markedly distorted, and the blades frequently fold themselves ventrally. Affected trees are retarded in growth. Bud inoculation tests appeared to indicate that the disease is of virus origin with a 2-yr. incubation.

The ascogenous stage of the peach constriction-disease pathogen, J. W. ROBERTS. (U. S. D. A.). (*Phytopathology*, 32 (1942), No. 4, pp. 334-335, fig. 1).—Although this stage, developing in culture, is considered to be *Diaporthe eres* in the sense of Wehmeyer or *D. pernicioso* in the sense of many European investigators, it is pointed out that taxonomic relationships among the species of *Phomopsis* on fruits can not at present be determined with certainty.

Further notes on the incubation period of the peach mosaic virus, E. W. BODINE. (Colo. Expt. Sta.). (*Science*, 95 (1942), No. 2462, pp. 256-257).—Under spontaneous conditions of spread in this test, the incubation period was about 100 days or less and the spread occurred in spring, re-emphasizing the need for immediate removal of trees as soon as leaf symptoms appear.

Propagation problems—research for nematode-resistant peach: Experience with Shalil variety, F. R. BRISON. (Tex. A. and M. Col.). (*South. Florist and Nurseryman*, 52 (1941), No. 8, p. 9).—Among the several nematode-resistant peach stocks known, the Shalil is said to be most promising. Though usually highly resistant, it is possible that some reports of its susceptibility may have been due to seedling variability. If so, the vegetative propagation

of individual stocks of proved resistance would be the solution. Preliminary tests indicated that the Shalil will develop its own roots when a long scion is grafted to a nurse root, or when it is budded onto a seedling stock and after a year's time set so that 8-10 in. of the budded top is below the ground line.

A cranberry sanding experiment, C. S. BECKWITH. (N. J. Expt. Stas.). (*Amer. Cranberry Growers' Assoc., Proc. Ann. Conv.*, 72 (1941), pp. 17-19).—In the spring of 1941 Early Black cranberry plants were set in a series of small plats, half of which had the water table at 16 in. and half at 8 in. below the surface. Among the different sanding treatments a 1-in. layer of coarse sand resulted in the best growth. The best growth of all, however, occurred on the unsanded control areas, but here weed growth was excessive. The 16-in. water level was distinctly better than the 8-in. level, except in the case of the coarse sand applied 3 in. deep where there was no difference.

The time of application of a bordeaux-pyrethrum spray to cranberries, R. B. WILCOX. (U. S. D. A.). (*Amer. Cranberry Growers' Assoc., Proc. Ann. Conv.*, 72 (1941), pp. 21-22).—This combination spray has been found entirely safe on buds and fertilized flowers, but it is believed best to avoid its use on full blooms until definitely proved noninjurious.

A necrotic "fern-leaf" mosaic of raspberry, G. C. CHAMBERLAIN (*Sci. Agr.*, 22 (1941), No. 2, pp. 119-124, figs. 2).—The author described a virus-induced necrotic spotting of the leaf, marked retardation of foliation, and an irregular blotch and spot type of mottle, which was readily transmitted to *Rubus* spp. by panel-type patch grafting but not by the insects tested. The Cuthbert and Viking varieties proved most susceptible. Plants infected with a combination of fern leaf mosaic and green mottle mosaic exhibited symptoms of both. The disease is not as yet economically important, and is believed to be a chance infection from an unusual source.

Promising strawberry crosses resistant to the red stele disease, W. F. JEFFERS and G. M. DABROW. (Univ. Md. coop. U. S. D. A.). (*Peninsula Hort. Soc. [Del.] Trans.*, 55 (1941), pp. 20-23).—This is a progress report on a cooperative breeding and selection project, with a tabulation of four groups of hybrids separated according to relative resistance and notes on the five most promising.

The banana in Central America.—II, The control of Cercospora leaf disease, C. W. WARDLAW (*Nature [London]*, 147 (1941), No. 3725, pp. 344-349, figs. 7).—This is a general discussion of the disease due to *C. musae* and its control, based on investigations to date.

The nature of sun-blotch and its practical control, W. T. HORNE, E. R. PARKER, and M. B. ROUNDS. (Calif. Citrus Expt. Sta.). (*Calif. Avocado Soc. Yearbook*, 1941, pp. 35-38).—This is a brief summary of the history, cause, symptoms, and suggested control methods. It is found due to a virus which thus far has been transmitted only by bud and graft unions and which is at least not usually carried by the seed. Obviously prevention is the only sure control method, and thus very careful and frequent inspection should be made of mother trees from which scions and buds are to be taken. See also an article by Stevens (E. S. R., 81, p. 388).

Avocados and oak root fungus, K. M. SMOYER (*Calif. Avocado Soc. Yearbook*, 1941, p. 86).—A note suggesting that avocado may not be immune to the oak root fungus which so extensively infests citrus orchards in California, and that until this point is cleared up only experimental plantings should be made on infested soils.

Avocado trunk cankers, W. T. HORNE, L. J. KLOTZ, and M. B. ROUNDS. (Calif. Citrus Expt. Sta.). (*Calif. Avocado Soc. Yearbook* 1941, pp. 46-47).—The pre-

vious status of these diseases is briefly reviewed, and the results of inoculation tests (1940) are presented, indicating that *Phytophthora citrophthora*, *P. cactorum*, *P. cinnamomi*, and *Botryosphaeria ribis* were all capable of aggressive attack on both avocado and walnut (Persian) trees.

Phytophthora parasitica on papaya (*Carica papaya*) in Hawaii, G. K. PARRIS. (Hawaii Expt. Sta.). (*Phytopathology*, 32 (1942), No. 4, pp. 314-320, figs. 3).—In a Hawaiian papaya disease causing hard rotting of fruits and cankers on the stem, affected fruits fall prematurely and mummify, whereas cankered stems may be girdled and the tops die from lack of water and nutrients or the stem may snap off in the wind at the cankered zone. Symptoms on the plant as a whole resemble those of *Pythium* root rot, but in the field the roots are not thought to be attacked by *Phytophthora parasitica*, the cause of the disease here studied. The fungus is essentially a wound parasite, though it will infect wound-free stems, fruits, roots, and leaves under moist chamber conditions. In a large number of cases the fungus was recovered and identified from artificially induced lesions. Growers decapitate diseased trees, since beheaded plants produce fruits sooner than do replants. Though not yet tried, a Cu fungicide will probably control the disease. Bordeaux mixture russets papaya fruits, burns young foliage, and stunts the plant, but Cuprocid 54-Y did not produce these harmful effects.

Mikromitsety chalnogo kusta (s opisaniem vazhneishikh boleznei imi vyzvyvaemykh) [The micro-organisms of the tea bush, including descriptions of the most important diseases caused by them], P. I. NAGORNYI (Izv. Gruzinsk. Opytn. Sta. Zashch. Rast., Ser. A, Fitopatol. (Bul. Georgian Expt. Sta. Plant Protect., Ser. A, Phytopathol.), No. 1 (1938), pp. [1]+131; Ger. abs., pp. 87-127).—One bacterial and 51 fungus diseases are considered.

A brownish sooty mould, *Phaeosaccardinula javanica* (Zimm.) comb. nov., on persimmon, W. YAMAMOTO (Taihoku Imp. Univ., Phytopathol. Lab., Contribs., No. 55 (1940), pp. [1]+254-264; Jap. text; Eng. abs., p. 264).

Current investigations on the control of filbert and walnut blight, P. W. MILLER. (U. S. D. A.). (Oreg. State Hort. Soc. Ann. Rpt., 33 (1941), pp. 120-123).—It is concluded from the results of current and past studies (E. S. R., 81, p. 534) that timely spraying with bordeaux will materially reduce the incidence of blighted buds and twigs due to infection with the filbert organism (*Phytonomonas corylina*). Walnut blight was found controllable by a 20 percent copper oxalate dust (E. S. R., 84, p. 487) but at too high cost for general use. Later experiments have indicated yellow cuprous oxide (2-200), a cheaper material, to be equally effective and also without appreciable foliage injury. Furthermore, a dust composed of 10 percent yellow cuprous oxide, 15 percent micro-S, 65 percent soapstone, and 10 percent diatomaceous earth gave outstandingly good control, approximating bordeaux (6-2-100) in effectiveness but without the accompanying injury of the latter.

El "mal de la tinta" del nogal en la República Argentina ["Mal de la tinta" of walnut in Argentina], R. E. PONTIS (Rev. Argentina Agron., 8 (1941), No. 4, pp. 317-325, pls. 3; Eng. abs., p. 324).—Studies of this destructive disease of the trunk, crown, and roots of the English (Persian) walnut (*Juglans regia*) in Argentina identify it as due to *Phytophthora citrophthora*. The macroscopic and microscopic symptoms are described and the results of the etiologic and control studies detailed.

A report of progress of studies on the causes of the decline and death of walnuts in Oregon, P. W. MILLER. (U. S. D. A.). (Oreg. State Hort. Soc. Ann. Rpt., 33 (1941), pp. 124-126, fig. 1).—Only one parasitic disease, viz, mush-

room root rot due to *Armillaria mellea*, has been found associated with walnut decline in the State. Among the more important nonparasitic factors thus associated have been the "black-line" or girdle disorder, shallow soil, drought, too close planting, poor drainage, and winter injury. The decline and death of a planting is said to be accelerated by the association and simultaneous operation of two or more of these factors.

Relationship of insects to the spread of azalea flower spot, F. F. SMITH and F. WEISS (*U. S. Dept. Agr., Tech. Bul. 798 (1942), pp. 44, figs. 8*).—In a study of the insects visiting azalea flowers and their possible relationship to azalea flower spot caused by *Ovulinia azaleae*, five species of bumblebees and two of carpenter bees, the honeybee, and *Emphoropsis floridana* (Smith) were the most conspicuous visitors, although thrips, flies, and many other insects were noted. The number of insects varied considerably during the season and in different localities. Insects caused flower abrasions, but flower spot infections occurred independently. Spores of the disease were noted among hairs on legs of insects collected on azalea. Positive cases of infection were obtained with honeybees, bumblebees, carpenter bees, solitary bees, a thrips (*Heterothrips azaleae*), ants, and a fly (*Hylemya* sp.). Infections were obtained with heads and legs of the honeybee, bumblebees, carpenter bees, and solitary bees, but not with pollen even when taken from infective insects containing spores among pollen grains.

It is concluded that while insects are at times efficient vectors of the organism they are not primarily responsible for the development of the disease when once it has become established in a given planting. Insects may be concerned with spread of the disease to nearby plantings of azalea. Disease control rather than insect control appears to be the logical means of attacking the problem.

Uses Spanish moss mulch to "suppress" azalea flower-spot fungus, H. L. DAUNOX (*South. Florist and Nurseryman, 52 (1942), No. 14, p. 9*).—Heavy mulching in three gardens is said to have suppressed the spring infection so that blooms extended almost to their maximum. Apparently no primary infections occurred in these gardens, but the points are stressed that for prevention of secondary infections community cooperation must be had and that for each season a new mulch must be used.

A bacterial necrosis of the giant cactus, P. C. LIGHTLE, E. T. STANDRING, and J. G. BROWN (*Ariz. Expt. Sta.*). (*Phytopathology, 32 (1942), No. 4, pp. 303-313, figs. 5*).—A bacterial necrosis of the giant cactus (*Carnegiea gigantea*) is said to be killing varying numbers of that species over an extensive area in southern Arizona. That the thinning of cactus groves now in progress may have been repeated in the past and may have continued until the affected groves became sparse or actually disappeared is suggested. Macroscopic and microscopic features of the necrosis are considered, and *Erwinia carnegicana* n. sp., shown to be the cause, is described.

La verticilliosi del garofano (nota preliminare) [Verticilliose of carnations (preliminary note)], E. M. CALVINO (*Costa Azzurra, 20 (1940), No. 7-8, pp. 82-83*).—On *Verticillium cinerescens*.

Chrysanthemum diseases, P. E. TYLFORD (*Ohio Expt. Sta.*). (*Chrysanthemum Soc. Amer. Bul., 9 (1941), No. 4, pp. 5-9*).—Among the 10 or more diseases of this ornamental, the 3 most prevalent are here discussed, viz, nematodes, *Septoria* leaf blight, and *Verticillium* wilt, with lists of resistant varieties.

Puccinia distincta McAlp. as the cause of English marigold rust, **D. A. HERBERT** (*Jour. Austral. Inst. Agr. Sci., 7 (1941), No. 1, pp. 27-28*).—The author

presents evidence that *P. calendulae*, cause of rust of *Calendula officinalis*, is identical with *P. distincta* from *Bellis perennis* and with *P. cinerariae* from *Senecio cruentus*, and he unites them, along with *P. allanii*, under *P. distincta*.

Control program for peony measles, D. B. CREAGER. (Ill. Nat. Hist. Survey). (*Florists' Rev.*, 89 (1941), No. 2296, pp. 22-23, figs. 2).—Since Elgetol, a proprietary sodium dinitro-o-cresylate compound, had been reported as an effective floor spray for apple scab control, it was tried against the widespread peony disease known as measles or rust. The results of this preliminary test showed a striking reduction of infection, clearly indicating the practical possibilities of this preparation in a peony disease control program.

False blossom in periwinkles and its cure by heat, L. O. KUNKEL (*Science*, 95 (1942), No. 2462, p. 252).—The virus-induced cranberry false blossom was transferred via dodder to periwinkle (*Vinca rosea*) and other plants. It was easily cured in periwinkle tops by 40° C. at 1 week and in both roots and tops at 2 weeks without serious injury to the host.

Poinsettia scab discovered in Honolulu, A. E. JENKINS. (U. S. D. A.). (*Phytopathology*, 32 (1942), No. 4, pp. 335-336, fig. 1).—The tentative identification, by E. A. Bessey, of *Sphaceloma* as the cause of a severe diseased condition of double poinsettia (*Euphorbia pulcherrima*) discovered in Hawaii (1939) is verified. The disease is evidently the same as that of double poinsettia discovered independently by the author in Florida (1940) and already identified by Ruehle (1941) as *Sphaceloma* scab (E. S. R., 86, p. 211).

Effect of crop rotation on crown-gall and root-knot in east Texas experiment with roses, E. W. LYLE. (Tex. Expt. Sta.). (*South. Florist and Nurseryman*, 52 (1941), No. 8, p. 7, figs. 2).—Soil on which roses were badly infested with both crown gall and root knot in 1937 was planted in 1938 and 1939 to resistant crops (Iron cowpeas, oats, and *Crotalaria*), and in December 1939 one-half of the area was bedded and replanted to rose cuttings, part of which were treated with HgCl₂ (1-1,000). In October 1941 about 3 percent of all plants had crown gall as against 53 percent in 1937, whereas the root knot had increased from 80 to 100 percent in the same period. Only 0.97 percent of the treated cuttings developed crown gall as against 5.66 percent for the untreated. Thus both the treatment and the rotation were effective against crown gall, though neither was adequate for combating root knot nematodes.

The effect of temperature on symptom expression of a rose mosaic, K. F. BAKER and H. EARL THOMAS. (Univ. Calif.). (*Phytopathology*, 32 (1942), No. 4, pp. 321-326).—In tests with two rose varieties under controlled environment, mosaic symptoms were favored at 15°-25° and greatly reduced in severity only below 15° C. Under carefully controlled environmental conditions, as under fluctuating greenhouse situations, there was an erratic appearance of symptoms in comparisons between adjacent leaves or companion leaflets. The temperature response of the varieties was consistently distinct as to growth, but in mosaic symptom expression it was the same. Because of the wide limits in favorable temperature range for mosaic symptoms, it should be possible for certain purposes to grow satisfactory budwood under greenhouse conditions where diseased plants can be recognized and eliminated and danger of new infections is slight. There was no evidence of mosaic spread in commercial greenhouses.

A bacterial disease of stocks caused by *Phytomonas matthiolae*, R. MUSHIN (*Roy. Soc. Victoria, Proc., n. ser.*, 53 (1941), No. 1, pp. 192-205, figs. 2).—This disease, reported on *Matthiola incana annua* in Victoria (1938), was proved due to *P. matthiolae*, and the results of a pure culture study on the morphological, cultural, and physiological characters of the organism are presented in detail.

New diseases of ornamentals (azalea, camellia, hibiscus, poinsettia, conifer ailments), A. A. DUNLAP. (Tex. A. and M. Col.). (*South. Florist and Nurseryman*, 52 (1941), No. 9, pp. 3, 25-27, figs. 2).—Brief notes are presented on diseases of these ornamentals which are comparatively new or only recently introduced into the Gulf coast area.

Disease of Chinese elm (*South. Florist and Nurseryman*, 52 (1942), No. 23, p. 26).—Attention is called to an apparently new disease of witches'-broom type found in the vicinity of Oklahoma City.

Needle blight and late fall browning of red pine (*Pinus resinosa* Ait.) caused by a gall midge (Cecidomyiidae) and the fungus *Pullularia pullulans* (De Bary) Berkhout, W. R. HADDOW (*Roy. Canad. Inst., Trans.*, 23 (1941), pt. 2, pp. 161-189, pls. 4).—Since the diseases studied may cause severe defoliation which could not be tolerated for many seasons they are potentially dangerous, but where observed in Ontario they have come under natural control through parasitism. A cecidomyiid gall midge is said to be the initiating agent of both. Needle blight is due to infection of the needle bases on midge-infested short shoots by the fungus *P. pullulans*. Late fall browning results from injury by the larva of this midge alone. The symptoms are described, the history of these and similar diseases in America and Europe is reviewed, and the life history of the midge is given. Chalcid flies parasitize the midge larvae and are important in their control, of the two species found *Platygaster flicornis* being the more abundant. There are 46 references.

ECONOMIC ZOOLOGY—ENTOMOLOGY

[Investigations in economic zoology and entomology by the Delaware Station]. (Partly coop. U. S. D. A. et al.). (*Delaware Sta. Bul.* 235 (1941), pp. 20-29, figs. 4).—A report on progress (E. S. R., 85, p. 84) of work by L. A. Stearns, R. L. Pierpont, D. MacCreary, K. J. Kadow, M. W. Goodwin, J. M. Amos, W. A. Connell, R. L. Mentzer, and F. C. Daigh which notes support given to the national defense program in mosquito control; campaign to reduce Japanese beetle populations; advances in the insecticidal field; important insects of the year (the European corn borer, spittle bug *Philaenus spumarius* (L.), clover-seed caterpillar *Laspeyresia interstinctana* Clem., raspberry sawfly *Blennocampa rubi* Harr., white apple leafhopper, saddleback caterpillar, tropical rat mite, a mining bee *Andrena perplexa* Smith, and the eastern tent caterpillar); cover sprays for apples; bionomics and control of the oriental fruit moth; ethylene dichloride emulsion for peach tree borer control; barium fluosilicate and cryolite for prevention of damage by the strawberry weevil; and importance of rodent trapping emphasized by increasing number of cases of Rocky Mountain spotted fever.

[Work in economic zoology by the Iowa Station] (*Iowa Sta. Rpt.* 1941, pt. 1, pp. 155-158, 159-165, 166).—Reports of progress (E. S. R., 85, p. 217) of work by T. G. Scott, P. L. Errington, G. O. Hendrickson, E. R. Becker, E. A. Benbrook, and R. M. Bailey are given on quail and pheasant management; duck studies; ecology of the muskrat; trapping technic for the spotted skunk (*Spilogale interrupta*); ecology and management of the mourning dove (*Zenaidura macroura carolinensis*) and the western mourning dove (*Z. macroura marginella*), raccoon (*Procyon lotor*), northern plains red fox (*Vulpes regalis*), and of the western fox squirrel (*Sciurus niger rufiventer*); studies with the cottontail rabbit (*Sylvilagus floridanus mearnsi*); parasites and diseases of foxes; and a preliminary survey of Iowa fishes.

Rabbits—a hazard to coniferous plantations, M. W. DAY (*Michigan Sta. Quart. Bul.*, 24 (1942), No. 3, pp. 252-253).—The damage caused by rabbits of all

species often results in a high mortality in coniferous plantations. In an experiment at the Dunbar Forest Experiment Station near Sault Ste. Marie 100 red pine transplants were set out in each of two suitable areas, one in a 10-year-old aspen stand, the other adjacent to an older plantation and covered with shrub growth. Alternate trees planted were protected with $\frac{1}{4}$ -in. wire screen and the others had no protection. Rabbit damage began almost at once and continued throughout the summer. Five months after planting only 8 percent of the unprotected trees were undamaged. Most of these damaged trees would recover if unmolested, but many of them had already been damaged several times, and it can be concluded that the unprotected trees will not develop into thrifty trees. All conifers are subject to rabbit damage, but pine seems to be preferred to spruce and fir. Often the buds and shoots are not eaten but are merely nipped off and left. Trees are subject to heavy damage until they have grown out of reach of the rabbits, and in areas of heavy snowfall this is not until after they are 3 or 4 ft. in height. While it is possible to control rabbits partially by hunting, this measure is seldom completely effective and considerable damage will still occur. Ordinarily the rabbits are reluctant to enter open areas, and plantings made in open fields and other open areas will be fairly safe from damage. The rabbits will usually damage plantations severely only within 100 ft. of brush or timber areas which furnish them with cover. The snowshoe rabbit prefers swampland and damage by it is particularly severe adjacent to swamps. The station has found that cheap chemical repellents are effective in reducing cottontail damage to young trees (see E. S. R., 86, p. 63). These will also be effective on coniferous planting stock but would have to be applied each year until the foliage and succulent wood has grown beyond reach.

The snowshoe rabbit enquiry, 1939-40, D. and H. CHITTY (*Canad. Field Nat.*, 56 (1942), No. 2, pp. 17-21, fig. 1).—The information presented includes a summary of the reports of 551 observers in Canada, United States, and Alaska on changes in the numbers of snowshoe rabbits or varying hares (*Lepus americanus*) in 1939-40 as compared with the preceding 12 mo. Recovery from the bottom of the latest 10-yr. cycle was proceeding rather slowly in most areas, while in others the abundance of rabbits had become noteworthy.

The development of the tegmentum vasculosum in the cochlea of the bob-white quail (*Colinus virginianus* L.), F. C. BUSINSKY (*Diss., Catholic Univ. Amer., Washington, D. C.*, pp. V+64, pls. 24).—This report of a histological study is presented with a list of 27 references to the literature.

Nesting of the ruddy duck in Iowa, J. B. LOW. (Iowa Expt. Sta. et al.). (*Auk*, 58 (1941), No. 4, pp. 506-517, pl. 1).

Ticks affecting birds' eyesight, R. H. THOMAS (*Auk*, 58 (1941), No. 4, pp. 590-591).—During 4 yr. in which the author banded 1,253 birds, including some nestlings, representing 28 species, ticks, particularly of the genus *Ixodes*, were found on 10 slate-colored juncos (*Junco hyemalis hyemalis*), 5 white-throated sparrows (*Zonotrichia albicollis*), 2 eastern mockingbirds (*Mimus polyglottos polyglottos*), and 3 eastern cardinals (*Richmondia cardinalis cardinalis*) in the vicinity of Little Rock, Ark.

Common names of insects approved by the American Association of Economic Entomologists, C. F. W. MUESEBECK. (U. S. D. A.) (*Jour. Econ. Ent.*, 35 (1942), No. 1, pp. 83-101).—The present list brings together the common names of insects approved by the American Association of Economic Entomologists which were published in 1937 (E. S. R., 77, p. 507) and in the two supplements which followed (E. S. R., 82, p. 70; 84, p. 74), together with many new common names and changes in previously accepted names approved in 1940. This list of (1) insects listed by common names (pp. 83-92) and (2) insects listed

by scientific names (pp. 92-101) supersedes and voids all previous lists. The scientific names that appear are said to have been checked by taxonomists of the Division of Insect Identification, U. S. D. A. Bureau of Entomology and Plant Quarantine, and to represent current usage in that organization.

Annual insect-damage appraisal, J. R. PARKER. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 1, pp. 1-10).—The annual address of the president of the American Association of Economic Entomologists, presented with a list of 27 references to the literature cited.

[Notes on economic insects and their control] (*Jour. Econ. Ent.*, 35 (1942), No. 1, pp. 15, 62, 73, 76, 102-113, figs. 11).—Contributions presented (E. S. R., 86, p. 651) are: Predators of *Trioza maura* Fors. (p. 15), Nitidulidae in Corn (p. 105), and Army Cutworm Outbreak in Utah (p. 113), all by G. F. Knowlton (Utah Expt. Sta.); Vegetable Weevils Spread by Motor Vehicles, by J. N. Roney (p. 62) (Tex. Sta.); An Unusual Experience With *Luotia sericata*, by G. H. Griswold (p. 73) (Cornell Univ.); Small Insect Cage, by M. D. Farrar (p. 76), and Plum Curculio on Peach Following a Total Crop Failure, by S. C. Chandler (pp. 106-107) (both Ill. Nat. Hist. Survey); *Reticulitermes tibialis* in Cottonseed Hulls, by C. H. Kinsley (p. 76); Injury From Peachtree Borer Treatments, by H. N. Worthley and H. M. Steiner (pp. 102-103) (Pa. Sta.); The Occurrence of Comstock Mealybug on Roots of Orchard Vegetation, by G. H. Geissler, E. Gould, and E. O. Hamstead (p. 103) (U. S. D. A. and W. Va. Sta.); *Scymnus creperus* Muls., a Predator on the Woolly Elm Aphid, by H. L. Sweetman and M. E. Smith (pp. 103-104) (Mass. State Col.); A Micro Leaf Worm [*Stegasta bosqueella* (Chambers)] on Peanuts, by T. L. Bissell (p. 104) (Ga. Sta.); Definition of Aerosol, by R. C. Roark (pp. 105-106), Dry Application of Cube or Derris in Combination With Wettable Sulfur for the Control of Cattle Grubs, by E. W. Laake (p. 112), and The Use of Power Sprayers in the Control of [Common] Cattle Grubs, by R. W. Wells (pp. 112-113) (all U. S. D. A.); Insect Food of the Sage Grouse [*Centrocerus urophasianus*] (pp. 107-108) and *Gracilaria negundella* Chambers in Utah (pp. 110-111), both by G. F. Knowlton and H. F. Thornley, and *Collops bipunctatus* Say, by G. F. Knowlton and W. Meier (p. 108) (all Utah Sta.); Sex Differentiation in the Polyembryonic Proclivity of the Hymenoptera, by S. E. Flanders (p. 108) (Calif. Citrus Sta.); An Epizootic Among the Thistle Hoppers (*Aeolopus turnbulli bruneri* Caud.) in Kansas, by D. A. Wilbur and R. F. Fritz (p. 109) (Kans. Sta.); Variations in the Length of the Life-Cycle of Wireworms [*Ludius acrolepennis destructor* Br.], by E. H. Strickland (pp. 109-110); *Tenebroides corticalis* Melsh. Predaceous on Codling Moth Larvae, by A. M. Woodside (p. 110) (Va. Sta.); and Hosts of *Merodon equestris* Fabr., by E. P. Breakey (pp. 111-112) (West. Wash. Sta.).

[Entomological investigations by the Iowa Station] (*Iowa Sta. Rpt. 1941, pts. 1, pp. 150-155, 158-159, 165; 2, pp. 59-60, 61, figs. 2*).—A progress report (E. S. R., 85, p. 218) which discusses in part 1 the influence of meteorological factors upon honey production and factors involved in the transformation of nectar into honey by the honeybee, both by O. W. Park; wheat insect pest survey, biology and control of onion insects, particularly as vectors in the yellow dwarf disease, and a survey of potato insects, all by C. J. Drake; bionomics and control of the codling moth and other apple insects, by C. H. Richardson; emergency investigations of the spring cankerworm, mosquitoes, and stored grain insects, by Drake and Richardson; variation in resistance to American foulbrood in honeybees, by Park and F. B. Paddock; and biology, ecology, and control of grass-feeding grasshoppers (nonmigratory grasshoppers of economic importance) in Iowa, by Drake and G. C. Decker. Part 2 takes up white grub investigations, by Drake and E. V. Collins; ecology and control of

sod webworms in permanent pasture and cultivated fields, by Decker; and blonemics and control of the chinch bug, by Drake, Richardson, and Decker.

[Entomological investigations by the Maine Station] (*Maine Sta. Bul.* 405 (1941), pp. 409-412, 415-417, 418-420, 421-424, 437-438, 510-513, fig. 1).—A progress report (E. S. R., 85, p. 642) noting work by F. H. Lathrop, J. H. Hawkins, and G. W. Simpson on the gypsy moth as an apple pest, the apple maggot, Mexican bean beetle, control of the striped cucumber beetle, pea aphid, wireworms affecting field and garden crops, aphids in relation to the spread of potato virus diseases, blueberry maggot, and the blueberry thrips *Frankliniella vacuolii* Morg.

Control of insect pests and diseases of New Mexico crops, J. R. EYER and R. F. CRAWFORD (*New Mexico Sta. Bul.* 288 (1942), pp. 50, figs. 12).—A practical account of insect and plant disease control for New Mexico conditions.

The battle against insects, H. L. WALSTER (*North Dakota Sta. Bmo. Bul.*, 4 (1942), No. 4, pp. 6-10).—A discussion of general economic insects, with special emphasis on those especially harmful to clover and alfalfa, stored grain, sugar beets, potatoes, and grain, as well as mention of bumblebees, leaf miners, control of grasshoppers by tillage, and hibernation of the potato leafhopper.

[Entomological investigations by the Puerto Rico University Station] (*Puerto Rico Univ. Sta. Rpt.* 1941, pp. 48-49, 55-57, 64, 67).—A progress report (E. S. R., 86, p. 65) which notes work by F. Sein, Jr., G. N. Wolcott, and L. F. Martorell on the coffee leaf-miner *Leucoptera coffeella*, poison for the control of the "hormiguilla" *Myrmelachista ramulorum* Wheeler in coffee groves, the establishment of the changa parasite *Larra americana* Sauss., control of the sugarcane borer by egg parasites (*Trichogramma minutum* Riley), investigation of insect injury causing rotting and exudation of gum in young pineapple fruits, and a study of the pepper flower bud moth *Gnorimoschema gudmannella* Walsh.

Ectoparasite-host records from the Sierran region of east-central California, G. F. AUGUSTSON (*South. Calif. Acad. Sci. Bul.*, 40 (1941), No. 3, pp. 147-157).

Insect distribution and seasonal succession in overgrazed and normal grasslands, W. R. COYNER (*Okla. Univ. Bul.* 850, n. ser. (1941), pp. 105-106).

Protecting cotton from insects and plant diseases, F. A. FENTON and K. S. CHESTER (*Oklahoma Sta. Cir.* 96 (1942), pp. 32, figs. 14).—A practical account.

Current contributions on potato insects, W. A. RAWLINS. (Cornell Univ.). (*Amer. Potato Jour.*, 19 (1942), No. 3, pp. 42-47).—This review of recent work with potato insects is presented with 36 references to the literature.

Insect damage to tobacco in the Connecticut River Valley, A. W. MORELL, JR. (U. S. D. A. coop. Conn. [New Haven] Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 1, pp. 60-62).—This is a summary of insect damage to tobacco in the Connecticut River Valley, based upon annual surveys conducted in the tobacco-producing areas during the period 1938-40. They were made just prior to harvest on mature tobacco, largely of the Havana seed type, and also on seedling and newly set tobacco.

Insecticidal action of *Millettia pachycarpa* Benth., S. F. CHIU, S. LIN, and Y. S. CHUI (*Jour. Econ. Ent.*, 35 (1942), No. 1, pp. 80-82).—Toxicological experiments are reported which have shown that the seeds of the tall scandant papilionaceous shrub *M. pachycarpa*, long used as a fish poison, an insecticide, and a drug in Yunnan, China, possesses considerable toxicity to several species of insects, either as stomach or contact insecticides. It is concluded that the perfection of practical methods of extraction and preparation may make this plant more important economically as a source of insecticidal material. Further

studies on the chemistry and toxicology of the plant are said to offer a very promising field.

Rotenone content, an inherited character in the roots of devil's shoe-string (*Tephrosia virginiana*), V. A. LITTLE. (Tex. A. and M. Col. coop. Tex. Expt. Sta. and U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 1, pp. 54-57).—The results are reported of an investigation of *T. virginiana* as a possible source of rotenone and related compounds in order to determine if these compounds are inherited. Data on the influence of soil and climate are also included. It was found that highly toxic plants, on the basis of rotenone determinations and the modified Durham color test, retain their toxicity when transferred to a region yielding only mediocre material and also that they remain toxic when transferred from one soil type to another. It has also been demonstrated that highly toxic plants when isolated tend to produce offspring of similar toxicity, thus showing that the dominant factor in the manufacture of rotenone and related compounds in the plant is heredity. On the basis of these results, with the amount of variation in the rotenone content shown, it is believed that by following approved scientific methods of plant breeding and propagation highly toxic strains of *T. virginiana* can be developed.

The alkaloids of American hellebore and their toxicity to the American cockroach, E. J. SEIFERLE, I. B. JOHNS, and C. H. RICHARDSON. (Iowa State Col.). (*Jour. Econ. Ent.*, 35 (1942), No. 1, pp. 35-44).—Investigation of American hellebore (*Veratrum viride*), the use of which as an insecticide has declined greatly in the last few decades, primarily because of the nonuniformity of commercially available samples, the lack of an efficient method of assay, and the scarcity of information on the active components of the plant, led to the study here reported. This has resulted in the modification of the procedure employed for chemical determination of total alkaloid content of the plant to facilitate mechanical manipulation, to decrease the amount of nonalkaloidal impurities carried through the extraction procedure, and to increase the precision of the determination. "The presence in *V. viride* of jervine, pseudojervine, and rubijervine has been confirmed. Rubijervine was separated in very small amounts, but jervine and pseudojervine were the predominant alkaloids isolated from the plant. Germerine and protoveratrine, alkaloids highly toxic to vertebrates, which have been isolated from the European species *V. album*, could not be isolated from *V. viride*, the American species. Protoveratridine in small amounts and germine in larger quantities, both hydrolysis products of germerine, were isolated for the first time from *V. viride*. Germine resembled cevine, the hydrolysis product of cevadine and veratridine from sabadilla seeds, in chemical formula and many physical properties, but did not resemble it in chemical reactivity toward catalytic hydrogenation. Jervine and pseudojervine were found to be nontoxic to the American cockroach. Germine was somewhat toxic to the American cockroach, its median lethal dose being about 0.26 mg. per gram. The crude alkaloid fractions from which germine and protoveratridine were separated were highly toxic, indicating the possible existence in *V. viride* of some toxic alkaloid such as germerine."

A list of 42 references to the literature cited is included.

Distribution of arsenic in the body of the American roach, R. W. FAY. (Univ. Ill.). (*Jour. Econ. Ent.*, 35 (1942), No. 1, pp. 45-47).—A quantitative study of the passage through and the absorption of sodium metarsenite from the gut of the American cockroach is reported.

Evaluation of baits and bait ingredients used in grasshopper control, R. L. SHOTWELL (U. S. Dept. Agr., Tech. Bul. 793 (1942), pp. 51, figs. 6).—Of several experimental methods used for evaluating bait materials, the plat-and-cage

method proved most reliable, although the pan-bait method was the most commonly used to obtain the data in this study. An analysis of experimental data by the author and other workers indicates little ground for the use of cane or beet molasses, amyl acetate, citrus fruits, and salt in grasshopper bait to make it more attractive. Water and wheat bran are the true attractants, although various other carriers—sawdust, cottonseed hulls, and sugar beet pulp—have proved effective under certain conditions. The fastest kill observed by the author was with a bait consisting of 2 qt. of liquid sodium arsenite (4 lb. material) (white arsenic 5 lb. or sodium fluosilicate 4 lb. may be substituted), 100 lb. of bran or bran and sawdust mixture (not more than 50 percent sawdust except in dry regions), and 10 to 12 gal. of water. As good results were obtained when the bait was scattered at the rate of 7.5 lb. per acre as at 20 lb. It is almost impossible, however, to scatter bait by hand at less than 10 lb. per acre. Mineral oil instead of water to soften the bait showed promise. Mechanical methods for mixing and spreading are suggested. Bait should be spread when grasshoppers are most active on the ground, which is usually at air temperatures between 70° and 90° F.

A list of the 21 references to the literature cited is included.

Caddisfly larvae fouling a water tunnel, P. SIMMONS, D. F. BARNES, C. K. FISHER, and G. H. KALOOSTIAN. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 1, pp. 77-79, figs. 2).

Reactions of the citrus thrips to sugar in poisoned baits, F. MUNGER. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 1, pp. 51-53, fig. 1).—During the course of work with the citrus thrips it was observed that all active stages of the insect, even in the presence of tender lemon foliage, would feed voraciously on granulated sugar. Experiments conducted showing the mortality of the citrus thrips after different exposures to tartar emetic and to barium antimonyl tartrate, each mixed with sugar in various proportions, and following preconditioning with and without sugar are reported. The mortality is shown to have increased with the percentage of sugar (40 to 90 percent), both at 24 (34 to 70 percent) and 48 hr. (69 to 93 percent) of exposure. At the 24-hr. exposure the 40- and the 50-percent sugar combinations gave significantly lower kills than the 60-, 70-, 80-, or 90-percent combinations. At the 48-hr. exposure the 60-, 70-, 80-, and 90-percent combinations were significantly more effective than the 40-percent combination, and the 80- and 90-percent combinations were significantly more effective than the 50-percent combination.

Thrips held 18, 42, and 66 hr. on sugared lemon leaves showed no significant difference in susceptibility to the bait. Thrips deprived of sugar for 42 and 66 hr. were much more susceptible than those deprived for only 18 hr.

The effect of some insecticides on the immature stages of the potato and tomato psyllid (*Paratrioza cockerelli* (Sulc)), D. J. PLETSCHE. (Mont. Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 1, pp. 58-60, fig. 1).—In tests conducted first-instar nymphs of the potato and tomato psyllid were but slightly resistant to the insecticides used; in the fifth instar they revealed considerable resistance. The intervening instar groups had tolerances between these extremes. The nicotine sulfate-sulfur dust which gave the most consistent kills was the most difficult material to mix and apply. In the proportions used it tended to clog the duster. In addition it had to be used soon after mixing if maximum effectiveness was to be obtained. The liquid lime-sulfur spray which retained second rank in these tests is already a standard control recommended against the tomato and potato psyllid. The results indicate that insecticides will be most effective if applied when the younger, more susceptible nymphal instars predominate.

The geographical distribution of mealybug wilt, with notes on some other insect pests of pineapple, W. CARTER. (Hawaii. Pineapple Prod. Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 1, pp. 10-15, figs. 7).—Record is made of the occurrence of mealybug wilt of pineapples in Old World localities visited by the author in 1937-38, including South Africa, East Africa, Malaya, Philippine Islands, Australia, and Fiji. The findings are brought together in tables, including species of mealybugs other than the pineapple mealybug that were collected on pineapple. The incidence of the disease is low on virgin lands rich in organic matter and in areas of high rainfall without extreme temperatures. The pineapple mealybug was found wherever the pineapple plant was growing, and there is some evidence that green-spotting strains exist with a symbiont flora different from that of the green-spotting strain in Hawaii. There was no evidence of effective biological control of the pineapple mealybug, with the possible exception of a single case of fungus infestation in Queensland. Apart from occasional infestations of diaspine scale insects, only *Oryctes monoceros* Ol. and *Anomocaulus fulvovestitus* Fairm. were noted as serious, although rare, pests of pineapple.

Varietal susceptibility of potatoes to aphid injury, J. C. BURNHAM and D. J. MACLEOD (*Canad. Ent.*, 74 (1942), No. 2, p. 36).—Evidence obtained in the course of aphid-virus vector experiments conducted under field and cage conditions over a 3-yr. period has indicated that a decided variation in response to attack by the green peach aphid does exist among commercial potato varieties. The variations in susceptibility have been demonstrated by differences in the degree of foliage injury and by differences in tuber yield by weight. Varietal reactions range from extreme susceptibility to feeding injury in the foliage of Katahdin to a substantial resistance in the foliage of Green Mountain. In the latter case, over the entire period of the experiment aphid populations never increased to epizootic numbers, and no serious foliage injury occurred at any time as a result of the feeding of the green peach aphid. In the case of Katahdin, however, foliage injury occurred within 3 weeks of initial infestation, and under cage conditions the plants were completely dead in slightly more than 4 weeks from the date of infestation. Green Mountain under similar conditions at this time remained green and thrifty. Of eight other varieties examined, Up-to-Date and President both gave promising results as to foliage resistance to attack.

The migration of the strawberry aphid *Capitophorus fragariae* Theob., R. M. GREENSLADE (*Jour. Pomol. and Hort. Sci.*, 19 (1941), No. 1-2, pp. 87-106, pl. 1, figs. 7).—The importance in Great Britain of the wingless aphids of *C. fragariae* in all stages of growth and the adult winged forms in the transmission of certain virus diseases with which strawberry plants have become widely infected—known as xanthosis (or yellow edge) and crinkle—led to the investigation of its life history here reported. The main part of the contribution deals with the behavior of the winged generations, the relative humidity and wind velocity during the spring periods in 1937, 1938, and 1939 and during its autumn migration periods in 1938 and 1939 being presented in graphs.

In nature this aphid is practically confined to the cultivated strawberry plant, there being no migration to an alternate host, although it has been found very rarely on *Potentilla anserina*. The winged generations are economically important because they spread these strawberry virus diseases from field to field. The spring alate aphids are adult for a short period in May or June and often occur in very large numbers. Their occurrence is not correlated with the flowering period of the plant. The autumn alatae, on the other hand, are less numerous and occur over a longer period. It was found that extensive migration is likely to occur only during comparatively short periods, that extended migration of

the autumn winged aphids is unusual but can sometimes occur, and that the transmission of virus disease at that season is therefore possible. Plants become infested at distances of at least 400 yd. from infested plots of strawberries, and there is little doubt but that the aphids can migrate farther than this. Wild strawberry plants growing under natural conditions do not become colonized by the strawberry aphid, although cultivated plants growing under exactly similar conditions readily become infested. Under certain unnatural conditions wild strawberry plants may support large colonies of the aphids. The possible reasons for this are discussed, and experiments are described which suggest that a sense of smell is not concerned with the choice of a host plant by this aphid.

It is pointed out that the spread of the disease from plant to plant may be prevented by use of vaporized nicotine against the aphid, as reported by A. M. Massee and R. M. Greenslade in 1939.²

Aphid infestation of strains of corn as an index of their susceptibility to corn borer attack, L. L. HUBER and G. H. STRINGFIELD. (Ohio Expt. Sta. coop. U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 5, pp. 283-291, figs. 2).—Research results indicate that inbred lines of corn and their hybrids exhibit heritable differences in susceptibility to the corn leaf aphid, and that susceptibility to this aphid was measurably correlated with susceptibility to the European corn borer. Since aphid infestations can be estimated much more rapidly than corn borer infestations, it is suggested that preliminary classifications of breeding material in respect to susceptibility to the corn borer might be made on the basis of aphid populations.

The Japanese and two other beetles as rose pests, T. L. GUYTON (*Amer. Rose Ann.*, 1942, pp. 102-105, fig. 1).

The milky disease of the Japanese beetle, a new and effective control remedy, G. T. FRENCH (*Va. State Hort. Soc. Rpt.*, 46 (1941), pp. 55-60).

Rough-headed corn stalk-beetle, W. J. BAERG (*Arkansas Sta. Bul.* 415 (1942), pp. 22, figs. 9).—Adult rough-headed corn stalk beetles (officially known as sugarcane beetles) are deemed important pests of young corn and sugarcane as well as rice and strawberry plants. The larvae do no appreciable damage. Individual females deposit 100 or more eggs in the soil about the roots of corn or other host plants. Hatching occurs from 8 to 21 days later (average 13 days). The three larval instars average 14, 14, and 36 days, respectively, the pupal period 16 days, and the total period for incubation, larval development, and pupation 84.7 days. Proper drainage and thorough frequent cultivation aid in elimination of infestations. Late planting serves to escape beetle damage, since adult activities largely cease after June 1. Weather conditions, birds, and skunks often serve to reduce infestations.

Dichloroethyl ether for protecting melon plants from wireworms, R. E. CAMPBELL (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 1, pp. 26-30).—Further experiments with dichloroethyl ether (E. S. R., 77, p. 65) have shown that at strengths of 10 and 33 percent in a dust carrier applied to the melon seeds or in the soil at the time of planting it is repellent to wireworms, but is injurious to the seeds and plants. Applied at the time of planting in a dilute water solution, sprouting seeds and young plants were protected from wireworm attack. Protection continued for 3 weeks after one application and for 4 additional weeks after a second application. Too strong a solution injured germinating seeds. Injury varied in different types of soil. These experiments, while not conclusive, show promise in the search for a method of protecting melons and possibly other crops grown in hills from wireworm

² East Mallin [Kent] Res. Sta. Ann. Rpt., 28 (1940), pp. 92-94, figs. 2.

injury. The dichloroethyl ether acted primarily as a repellent against wireworms, but also killed those in the treated portion of the soil at the time of application.

Investigations on wireworms and their control, H. W. MILES and M. COHEN (*Univ. Manchester, Agr. Adv. Dept. Rpt., 3 (1939-40), pp. 31, figs. 10*).—This third report (*E. S. R., 82, p. 801*) relates to the life histories and habits of click beetles, particularly the common wireworm *Agriotes obscurus* L.; two parasites of the common wireworm, namely *Paracodrus apterogynus* Hal. and a nematode; wireworms and the ploughing up of grassland; wireworms and the potato crop; notes on their injury to miscellaneous crops; and the decrease in population under rotation cropping.

Biology of the weevil *Cylindrocopturus eatoni* Buchanan, injurious to ponderosa and Jeffrey pine reproduction, C. B. EATON. (U. S. D. A.). (*Jour. Econ. Ent., 35 (1942), No. 1, pp. 20-25, figs. 2*).—The results of biological studies and control tests on one of the various insects attacking reproduction in the pine forests of northeastern California, *C. eatoni*, described by L. L. Buchanan in 1940 as new to science,³ are reported. The injury of this weevil to ponderosa and Jeffrey pine is caused chiefly by the mining of the larvae within the cortical region of the host, which results in the death of the tree. Minor damage is caused by the feeding of the adults on pine needles. The insect has a 1-yr. life cycle. The winter is passed in the larval stage, pupation occurs in the spring, and the adults emerge in June. The weevils mate, and the females deposit their eggs in the stems and twigs of small trees early in July. Larval development from the egg and subsequent feeding within the cortical area is accompanied by the death of the tree. By the time the tree is completely brown the larvae have become mature. Experiments with concentrated sprays of both lead arsenate and cryolite showed that both these chemicals will effectively prevent injury to trees exposed to attack by the weevils.

Changes induced in the blood cells of the southern armyworm (*Prodenia eridania*) by the administration of poisons, J. F. YEAGER and S. C. MUNSON. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 64 (1942), No. 6, pp. 307-332, pls. 9, figs. 3*).—In continuation of the studies noted (*E. S. R., 86, p. 360*) the effects upon the blood cells and blood-cell glycogen of administering poisons to the larvae of the southern armyworm are reported. The poisons used were nicotine bentonite, nicotine peat, rotenone, pyrethrum, phenothiazine, calcium arsenite, calcium arsenate, arsenic trioxide, paris green, lead arsenate, sodium fluoride, sodium fluoaluminate, barium fluosilicate, and mercuric chloride. Blood smears from the fore and hind ends of the poisoned ligatured larvae were stained for glycogen. Photomicrographs illustrating the changes that took place in the blood cells are reproduced on nine plates, and the changes in glycogen indices and glycogen counts are illustrated by graphs. It is pointed out that the investigation was qualitative, and the results are reported as first approximations only. A list of 32 references to the literature cited is included.

Toxicity of some semicarbazones to codling moth larvae, E. H. SIEGLER, S. I. GERTLER, and H. L. HALLER. (U. S. D. A.). (*Jour. Econ. Ent., 35 (1942), No. 1, pp. 74-76*).—The results of check tests with ethanol solution and lead arsenate and of laboratory tests of semicarbazones against codling moth larvae and the effect of certain semicarbazones on apple and peach foliage are presented in tables. Ketone and aldehyde semicarbazones are readily prepared from semicarbazide hydrochloride. Out of 30 derivatives tested against the newly hatched codling moth larva, the following semicarbazones indicated some promise for

³ Ent. Soc. Wash. Proc., 42 (1940), No. 8, pp. 177-181.

insecticidal usage: *p*-Chloroacetophenone, 2-heptanone, cyclopentanone, 2-octanone, and 2-furaldehyde. In small-scale spray tests of these compounds (except 2-heptanone, which was not tried) on apple and peach foliage, no injury resulted except to a very slight extent with *p*-chloroacetophenone alone and combined with bordeaux mixture on Grimes Golden apple foliage.

Fighting the pink invader [pink bollworm], W. L. WICKLINE (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Agr. in Americas*, 2 (1942), No. 1, pp. 3-5, figs. 3).—An account of work under way in the Rio Grande Valley.

Methods of breeding *Chelonus annulipes* on the Mediterranean flour moth for use against the European corn borer, W. G. BRADLEY (*U. S. Dept. Agr. Cir.* 616 (1941), pp. 23, figs. 14).—*C. annulipes* Wesm., a braconid parasite of the European corn borer, was reared on immature stages of the Mediterranean flour moth for further colonization in the United States. Host eggs were obtained by confining flour moth adults in cardboard food cartons provided with a screened bottom through which the Mediterranean flour moth eggs were laid in flour. Cleaned eggs were placed on a moistened card to form circular clusters of about 100 eggs each. Mated parasite females were given access to one host egg cluster daily. During 1938 an average of 24.5 adult parasites were produced per egg cluster. The average number of adults produced per parasite female utilized was 783.

Comments on birds and codling moth control in the Ozarks, J. A. NEFF (*Wilson Bul.*, 54 (1942), No. 1, pp. 21-24).

Factors influencing codling-moth control, W. S. HOUGH. (Va. Expt. Sta.). (*Va. State Hort. Soc. Rpt.*, 46 (1941), pp. 114-118).

Preliminary studies on the control of the lodgepole needle miner, J. S. YUILL. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 1, pp. 16-20, fig. 1).—Report is made of a study conducted with the view to developing a method for protecting trees in intensively used recreation areas from the lodgepole needle miner. This pest is responsible for extensive killing of lodgepole pine (*Pinus contorta*) in localized areas in the Sierra Nevada Mountains of California. The egg and newly hatched larva are the most vulnerable stages in its life cycle. In small-scale control tests with materials, so-called inverted suspensions of lead arsenate with nicotine and quick-breaking oil emulsions proved to be the most effective, although more extensive tests under field conditions will be required before recommendations can be made. Since the insect is in flight only in alternate years, control measures are required only at 2-yr. intervals.

Toxicity to adult mosquitoes of aerosols produced by spraying solutions of insecticides in liquefied gas, W. N. SULLIVAN, L. D. GOODHUE, and J. H. FALES. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 1, pp. 48-51, fig. 1).—This contribution is in continuation of the work noted (F. S. R., 84, p. 643), in which it was shown that mosquitoes can be easily killed with an aerosol produced by spraying an alcoholic solution of pyrethrins onto a hot plate. Description is given of a new method of controlling mosquitoes in confined spaces. Aerosols of pyrethrum oleoresin and sesame oil were prepared by allowing a solution of these materials in dichlorodifluoromethane to escape through an atomizing nozzle. The solvent evaporates very rapidly and leaves the insecticide suspended in the air. After some preliminary tests to determine the dosage for complete mortality in 5 min., tests of a practical nature were run in *Culex*, *Aedes*, and *Anopheles* mosquitoes. *Culex* mosquitoes were fed only on sugar solution, but the other species were given a blood meal in addition. The nontoxic nature of this insecticide to man and animals, its noninflammability, its ease of application with no power requirement, and its nonstaining properties appear to make it satisfactory for the control of mosquitoes on airplanes. Additional preliminary

tests show the aerosol to be very effective against several kinds of flies, and it would seem to be promising against other insects.

Anopheles pseudopunctipennis Theobald, a vector of malaria in Mexico, L. VARGAS, G. CASIS S., and W. C. EARLE (*Amer. Jour. Trop. Med.*, 21 (1941), No. 6, pp. 779-788, fig. 1).—Observations by the authors in Mexico have led to confirmation of the finding of C. C. Hoffman⁴ that *A. pseudopunctipennis* is an important vector of malaria.

Seasonal abundance and distribution of certain blowflies in southern Arizona and their economic importance, C. C. DEONIER (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 1, pp. 65-70).—The seasonal and local abundance of three species of blowflies (the secondary screwworm, *Phormia regina* Meig., and *Lucilia sericata* Meig.) was determined by the use of conical fly traps in different localities in Arizona, where they frequently cause heavy losses to the livestock industry. The number of flies of these species taken in traps in 1937 and 1938 in four localities in the southern part of the State, representing various ecological types, is presented by months, together with data on temperatures and precipitation. In 120 myiasis cases the screwworm was involved in 105, and in 80 of these this species alone was present. *L. sericata* was involved in 26 cases, *P. regina* in 16, the secondary screwworm in 15, and *Sarcophaga* in 1 case, the respective numbers in pure culture being 7, 4, 2, and 1. In 7 cases the species involved was not determined.

A new parasitic muscoid fly from Texas, H. J. REINHARD. (*Tex. Expt. Sta.*). (*Ent. Soc. Wash. Proc.*, 44 (1942), No. 2, pp. 17-18).—Under the name *Sarcophaga austinana* description is given of a new parasite reared from adult mantids from Austin and San Marcos, Tex.

The biology of *Metagonistylum minense* Tns., a parasite of the sugarcane borer, K. A. BARTLETT (*Puerto Rico Sta. Bul.* 40 (1941), pp. 20, figs. 10).—This fly is readily propagated in the laboratory by dissection and removal of the uterus to obtain larvae for inoculation purposes. The larvae are placed on sugarcane borers and shortly thereafter they enter the body and commence feeding. Full-fed larvae emerge about 7 days later after almost completely consuming the host. The dark brown puparium is readily distinguished from other fly parasites of the sugarcane borer by markings of the anal spiracles. Adult flies emerge about 10 days later. The Amazon strain of this parasite is considered to be successfully established at a number of different points in Puerto Rico.

Dipterous parasites of adult mantids (Mantidae: Sarcophagidae), O. P. BRELAND (*Ent. Soc. Wash. Proc.*, 44 (1942), No. 2, pp. 19-22).—Notes are presented on the biology of the Carolina mantis.

Acquired resistance to phenothiazine by larvae of the primary screwworm, E. F. KNIPLING. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 1, pp. 63-64).

Field studies of certain benzene derivatives as larvicides and wound protectors against the screwworm, H. E. PARISH and E. F. KNIPLING. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 1, pp. 70-73).—In field work in 1938-39 with animals from selected ranches in Menard and Kimble Counties, Tex., wounds infested with the screwworm were treated with materials as larvicides and wound protectors which included pine-tar oil, diphenylamine, *p*-nitrophenetole, diphenylene oxide, and a mixture of diphenylamine 95 percent and calcium stearate 5 percent. Diphenylamine was found to be the most effective wound protector tested. Although *p*-nitrophenetole is slightly more effective than

⁴ South. Med. Jour., 25 (1932), No. 5, pp. 523-527.

diphenylene oxide, its use is considered out of the question owing to its cost. Diphenylene oxide proved slightly less effective than diphenylamine, but this material may be of practical use for screwworm control owing to its low cost and because it does not cake upon exposure to high temperatures as does diphenylamine. The addition of calcium stearate to diphenylamine to prevent caking decreases the effectiveness of diphenylamine as a wound protector.

Kryolite effective for fruit worm, Crystal Springs, F. J. LeBEAU (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 3, p. 8).—A practical account.

Apple maggot control requires careful timing of sprays, R. W. DEAN (*Farm Res. [New York State Sta.]*, 8 (1942), No. 2, pp. 16-17, figs. 3).—A practical account.

Methyl bromide for the control of the serpentine leaf miner in gerberas and notes on the insect's life history, F. S. BLANTON. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 1, pp. 31-34).—The serious damage caused by the serpentine leaf miner to the Transvaal daisy (*Gerbera jamesoni*), grown in the vicinity of Babylon, N. Y., where in some instances a 50-percent loss to the flower harvest has occurred, led to the control work here reported. It was found that the eggs of this leaf miner are laid in the upper surface of the leaf. They hatch within 5 to 10 days. The larvae feed for a period of from 6 to 10 days, there being sometimes as many as 250 in a single gerbera leaf. Natural pupation occurs in the soil, but a few individuals pupate on the surface of the leaf. The pupal period under summer greenhouse conditions ranges from 11 to 15 days. The complete life cycle has been as short as 27 days.

In fumigation tests with methyl bromide at a temperature of 70° F., or slightly above, complete larval mortality was obtained at dosages of 32 oz. to 1,000 cu. ft. for 2.5 hr. and 12 oz. for 4 hr., while over 99-percent mortality was obtained at 4 and 5 oz. for 12 hr. The only survival at the 5-oz. dosage occurred when the fan in the fumigation chamber did not operate. Complete egg mortality was obtained at dosages of 32 oz. to 1,000 cu. ft. for 2.75 hr., 12, 16, and 20 oz. for 4 hr., and 5 oz. for 12 hr. It appears that gerberas will tolerate a dosage up to 16 oz. to 1,000 cu. ft. for 4 hr., although with some foliage injury and a slight root injury to the more susceptible varieties, and this dosage should result in practically complete control of all stages of the serpentine leaf miner.

An annotated list of genotypes of the Chloropidae of the World (Diptera), C. W. SABROSKY. (Mich. Expt. Sta.). (*Ann. Ent. Soc. Amer.*, 34 (1941), No. 4, pp. 735-765).

The dispersion of *Larra americana* Saussure in Puerto Rico, G. N. Wolcott (*Rev. Agr., Indus. y Com., Puerto Rico*, 33 (1941), No. 4, pp. 606-608, fig. 1).—The progress of work with *L. americana*, a wasp specifically parasitic on the changa, the introduction of which into Puerto Rico was first undertaken in 1936, is reported upon.

ANIMAL PRODUCTION

[Investigations on nutrition, production, and storage of livestock and its products by the Iowa Station] (*Iowa Sta. Rpt. 1941, pts. 1, pp. 100-102, 103-104, 107-109, 110-113, 116-118, figs. 5; 2, pp. 67-69, fig. 1*).—Brief results on studies in progress and findings to date, by C. C. Culbertson, M. D. Helser, F. J. Beard, B. H. Thomas, S. H. McNutt, L. Yoder, H. L. Wilcke, P. S. Shearer, A. B. Caine, P. M. Nelson, G. F. Stewart, A. J. G. Maw, B. Lowe, C. D. Lee, and J. L. Robinson, are presented on chemical study of a rapid method for quantitative determination of collagen and elastin in animal tissues; factors influencing production of eggs uniformly rich in vitamin D; various feeds for

compounding rations high in vitamin E for livestock and poultry; factors present in linseed meal and oil responsible for finish of fattening steers; growth and development of colts; influence of temperatures on beef and pork of different grades held in storage; biological efficiency of several protein fractions on size and quality of eggs produced by hens; factors in oats which affect growth and feathering in the domestic fowl; the influence of age on growth and feathering in fowls; relation of fattening period and ration to gains and quality of market poultry; changes in the poultry carcass after slaughtering; specificity of wheat germ oil as a supplement to poultry rations; and relative efficiency of different types of corn for fattening steers.

Chemical composition and grazing value of Napier grass, *Pennisetum purpureum* Schum., grown under a grazing management practice, R. E. BLASER, W. G. KIRK, and W. E. STOKES. (Fla. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 2, pp. 167-174, figs. 3).—In 3 years' experiments Napier grass grazed by rotation on five plats heavily and lightly fertilized showed it to be palatable and nutritious during the entire season. Determinations of the composition of the grass before and after grazing showed the grazed material to be higher in protein and calcium than the residue after the steers were removed to other plats. The grass grown on heavily fertilized areas produced an average of 231 steer-days of grazing per acre with gains of 1.60 lb. per head daily, whereas 155 steer-days of grazing were furnished by lightly fertilized areas with average daily gains of 1.41 lb. per head.

The pantothenic acid content of feedstuffs as determined by microbiological assay, J. C. BAUERNFEIND, L. C. NORRIS, and G. F. HEUSER. (Cornell Univ.). (*Poultry Sci.*, 21 (1942), No. 2, pp. 136-141, fig. 1).—Employing the method of Snell, Strong, and Peterson (*E. S. R.*, 82, p. 162) and the modified method of Pennington, Snell, and Williams (*E. S. R.*, 85, p. 442) for the use of *Lactobacillus*, carefully autoclaved extracts of feedstuffs and calcium pantothenate were found to give constant and repeatable results at different assay levels. Samples of yeast from different sources proved to be the most variable and the most potent of any of the feedstuffs tested, ranging from 29.3 to 150.0 μ g. per gram. Hawaiian molasses contained 57.5 μ g. of pantothenic acid, with liver meat meal and dehydrated alfalfa next in potency. Barley and corn meal had, respectively, 7.2 and 6.7 μ g. per gram. These were less potent sources of pantothenic acid than corn gluten meal, soybean meal, wheat and oat products, fish meal, and meat scraps. ●

Carotene in feed grasses, J. ALLARDYCE and D. MILSOM (*Canad. Jour. Res.*, 20 (1942), No. 2, Sect. C, pp. 85-88, fig. 1).—The carotene contents of mixed grass samples of Yorkshire fog, Kentucky blue, bent, and timothy grass, with a small amount of red and white clover, cut at 7 and 12 in. in height and dried by artificial means, were found to vary considerably. Higher carotene contents were found in the young grass when the cuttings followed periods of increased daily sunshine, particularly if rains preceded it. Storing the ground dehydrated feed in 100-lb. paper-lined burlap sacks at 35° F. during the summer months reduced the average loss of carotene to 7.5 percent.

Digestibility studies with ruminants.—VIII, Associative digestibility of hay and grains, C. J. WATSON, J. A. CAMPBELL, W. M. DAVIDSON, C. H. ROBINSON, and G. W. MUIR (*Sci. Agr.*, 22 (1941), No. 4, pp. 250-270).—Continuing these studies (*E. S. R.*, 83, p. 383) and using eight grade Shorthorn steers, determinations of the digestibility of oats and barley showed reductions when these substances were fed with hay in the mixed ration. Fat in barley showed improvement in digestibility when fed with hay. The nutrients of oats were reduced in digestibility when calculated from the mixed ration as compared

with feeding oats alone. This feeding value reduction was approximately 5 percent although nitrogen and fat showed no significant differences.

Some high lights on the deficiency diseases, A. H. QUIN (*North Amer. Vet.*, 22 (1941), No. 5, pp. 287-291).—This deals with the mineral requirements of animals and the effects of associations between minerals and vitamins in animal metabolism and therapeutics.

Some endocrine relationships in nutritional reproductive failure (a review), H. R. GUILBERT. (Univ. Calif.). (*Jour. Anim. Sci.*, 1 (1942), No. 1, pp. 3-13, fig. 1).—In a comprehensive review of the role of endocrine secretions and nutrients in reproduction, the needs of the gonad-stimulating hormones of the anterior pituitary are pointed out. In addition to the vitamin B complex and C, synthesized by ruminants, other essential substances are vitamins A and E, phosphorus, manganese, iodine, proteins, essential fatty acids, and adequate nutrition needed for optimum reproduction by one or both sexes.

The effect of carbon dioxide on bacteria, with particular reference to food poisoning organisms, W. L. MALLMANN, L. ZAIKOWSKI, and M. RUSTEN (*Abstr. in Michigan Sta. Quart. Bul.*, 24 (1942), No. 3, p. 257).—A brief abstract is presented showing that spoilage of meat was decreased by the use of carbon dioxide and the maintenance of dry surfaces.

Yearlong grazing of steers in the northern Great Plains, W. H. BLACK and V. I. CLARK (*U. S. Dept. Agr. Cir.* 642 (1942), pp. 16, figs. 8).—Rotation and continuous grazing were compared at the Ardmore Field Station, Ardmore, S. Dak., for 4 yr. with 18 head on 2 areas of 350 acres each of native range, dominated by western wheat grass (*Agropyron smithii*), buffalo grass (*Buchloe dactyloides*), and blue grama grass (*Bouteloua gracilis*). One of these areas was grazed continuously for 1 full year, while the other was divided in half and the steers alternated between the 2 lots every 28 days. No advantage was shown in gains or appearance of the range for either system of grazing. Approximately 20 acres per head were sufficient to carry steers from yearlings to 2 yr. of age. The use of supplemental feed was rarely necessary.

Weight gains of cattle strongly influenced by weeds and shrubs as well as by grasses, D. F. COSTELLO. (Colo. Expt. Sta. coop. U. S. D. A.). (*Colo. Farm Bul. [Colorado Sta.]*, 4 (1942), No. 1, pp. 14-15, fig. 1).—Cattle grazing pastures of native grama and buffalo grass have consistently made better gains where weeds and shrubs constitute from 10 to 20 percent of the total forage than where grass stands are nearly pure. The prevalence of different kinds of weeds is indicative of the degree of grazing.

Pasture studies.—XXII, Dry matter defecation as an index of forage intake by grazing steers, E. W. CRAMPTON and T. L. PURDY (*Sci. Agr.*, 22 (1941), No. 4, pp. 242-249, figs. 2).—As Garrigus and Rusk (*E. S. R.*, 81, p. 692) found considerable discrepancy in the calculation of feed intake from fecal output and clippings, there is suggested the use of fecal dry matter along with the measure of actual digestibility as an indication of the true nutritive value of a pasture area in the continuation of this series (*E. S. R.*, 86, p. 10). These studies were conducted with two steers on a 1-acre plot of mixed pasture for a 3-mo. period. Fecal collections were made by a rubberized bag attached to each of the individuals with a canvas harness. There was evidently a 4-5-day interval between consumption and excretion of the feed residues. A definite seasonal trend in fecal dry matter output was established, and the loss was found not significantly greater than when steers were fed under controlled conditions.

Legume silage vs. corn silage vs. legume hay for fattening heifer calves, G. A. BRANAMAN and G. K. DAVIS (*Michigan Sta. Quart. Bul.*, 24 (1942),

No. 3, pp. 227-232).—In continuing these studies (E. S. R., 84, p. 659) rations of shelled corn and alfalfa hay; cottonseed meal, alfalfa hay, and corn silage; and shelled corn and alfalfa silage were compared in a 190-day feeding period for heifer calves averaging about 410 lb. at the start. The gains on the three rations were approximately equal, but the calculated feed costs per 100 lb. of gain were least on the corn silage ration. The silage from first-cutting alfalfa and considerable grass was eaten more readily than alfalfa hay. It was necessary to add considerable grain to grass silage to make it comparable to corn silage properly balanced for protein.

Feeding and management of market hogs, J. M. FARGO, G. BOHSTEDT, and J. J. LACEY (*Wisconsin Sta. Bul.* 454 (1941), pp. 22, figs. 4).—A review of various investigations carried on at the station brings out the relative efficiency and economy of gains produced in market hogs with pasture and protein supplements, including skim milk, whey, tankage, linseed meal, alfalfa hay, cheese meal, fish meal, and soybean meal. There are included comparisons of carbohydrate feeds, minerals, and general management practices.

Pig feeding experiments at the department's farms ([Irish Free State] Dept. Agr. Jour., 38 (1941), No. 2, pp. 382-386).—Although pigs in two experiments fed to bacon weights required somewhat longer feeding periods with limited rations, the grading was better and less feed per unit of gain was required than when the pigs were full fed. In one test feed consumption was restricted to 80 percent that of full-fed pigs, and in another experiment with 72 pigs feed consumption was restricted to 0.25 and 0.5 full feed during the first half, or to two-thirds during the last half, of the feeding experiment for different lots of bacon pigs.

Study on vitamin deficiencies in sugar-beet molasses, R. A. RASMUSSEN (*Farm and Home Sci. [Utah Sta.]*, 3 (1942), No. 1, pp. 2, 4).—Young pigs, but not those over 100 lb. in weight, were found to develop a muscular incoordination and nervous condition when placed on rations which included 15-40 percent sugar-beet molasses, barley, tankage, alfalfa meal, and minerals. The abnormal condition was not prevented by inclusion in the ration of sources of vitamins A, D, B₁, B₂, nicotinic acid, and pyridoxin. Alfalfa pasture or cane molasses, as 50 percent of the molasses in the ration, gave complete protection but 10 percent was insufficient.

An improved method for determining the distribution of salt and water in cured hams. A. K. BESLEY and F. CARROLL. (U. S. D. A. coop. Univ. Md.). (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 5, pp. 293-306, figs. 5).—Portions of hams were found to vary so much in salt and water analysis that an improved method of sampling was devised. This was based on dissection of 10 muscle samples from 5 cross sections between the aitchbone and stifle joint of the hams. The second slice from the aitchbone represented the thickest and widest part of the ham, contained segments of all muscles in this region, and possessed average salt and water contents. This slice was selected as the most suitable for sampling purposes. It showed that the semimembranosus, biceps femoris, semitendinosus, and rectus femoris contributed 65 percent of the total meat in the slice. In the analytical procedure cutting up the meat before desiccation and comminuting segments from muscles after removal of water, particularly for muscle containing large quantities of fat, seemed advantageous.

Contributions of Raymond Pearl to poultry science, F. B. HUTT. (Cornell Univ.). (*Poultry Sci.*, 21 (1942), No. 2, pp. 99-107, pl. 1).—A review is given of the contributions of Dr. R. Pearl to the science of the poultry industry. References are cited to his publications, many of which were prepared with

Dr. F. M. Surface and Dr. M. R. Curtis, on the physiology of reproduction, biometrical study of egg production, experimental-modification of germ cells, and studies of inbreeding. Other papers deal individually with phases of poultry production.

Profitable poultry keeping, H. C. KNADEL (*New York: Orange Judd Pub. Co., 1940, pp. XX+462, figs. 227*).—The general principles of poultry feeding, egg production, management, marketing of poultry products, and control of poultry diseases are presented.

[Experiments in poultry breeding and production by the Delaware Station], A. E. TOMHAVE, W. C. SKOGLUND, and J. M. WATKINS (*Delaware Sta. Bul. 235 (1941), pp. 13-16*).—Brief results of investigations showed no higher egg weight produced by pullets sired by cockerels sib-tested for large egg size than by pullets sired by cockerels sib-tested for small egg size; improvement of meat type and feathering in broilers; improvement in pigmentation of broilers by feeds; limitation in the floor space for broilers; artificial lights for increased egg production; the value of grass and clover on range for poultry; increase in albumen score of eggs gathered frequently in warm weather; and a study of rations and methods of feeding for egg production.

The relation of shank color to winter egg production characteristics of Single-Comb White Leghorn pullets, I. M. LERNER (Calif. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 64 (1942), No. 6, pp. 333-338*).—About 28 percent of the variance in shank color in 930 Single-Comb White Leghorn pullets at 8 mo. of age fed yellow corn and barley rations was found due to egg production. Other variables which entered into the combined relationship included body weight, rate of production, and pause. The multiple determination of shank color with egg production and body weight as the independent variables was increased to 32.74 percent, but differences were not controlled by single factors.

Rations and methods of feeding White Leghorn pullet layers, D. C. KENNARD and V. D. CHAMBERLIN (*Ohio Sta. Bimo. Bul. 214 (1942), pp. 10-16*).—Continuing the studies of feeding different proportions of grain and mash to White Leghorn pullets (E. S. R., 85, p. 805), there was found to be no appreciable difference in the amounts of protein consumed by groups receiving 22 and 32 percent protein, respectively, in the mash. However, when the consumption of the whole oats and corn was restricted to 2 hr. daily more mash was consumed, but the differences in protein intake were only 1.3 percent. No significant differences in body weights were noted. Egg production was somewhat higher with the higher protein percentages in the ration and when dried skim milk was fed in larger quantities.

Irish coral sand as a source of lime for laying hens, J. BROPHY and E. J. SHEEHY ([*Irish Free State*] *Dept. Agr. Jour.*, 38 (1941), No. 2, pp. 387-390).—In 7 lots of 15 hens and 1 rooster each fed ad libitum for 18 weeks with oystershell, brown coral, gray coral sand, and lime mortar, in different lots there was no suggestion of a decline in egg production, a change in the texture of the eggshell, or reduction in weight of the birds with a depreciation in health or vigor. The coral sands were considered adequate sources of calcium and they contained no substances inimical to health.

Feeding potatoes and oats to growing chickens, E. J. SHEEHY and E. M. BURKE ([*Irish Free State*] *Dept. Agr. Jour.*, 38 (1941), No. 2, pp. 361-366).—Due to the curtailment of corn and wheat products, boiled potatoes, oats, and barley must now be included in chicken mashes in the Irish Free State. Limitation of the grain mixture to 1.5 oz. per chick per day with boiled potatoes ad libitum did not give as good growth as limitation of the grain mixture to

2.5 oz. per bird per day. This produced as good growth to 11 weeks of age as a control ration. There were consumed by this method 7.5 oz. of boiled potatoes per bird per day during the twelfth week. In another experiment with as much as 50 percent oats in the mash there was less trouble from enteritis caused by the medium-ground oat husks when boiled potatoes were available. The different rations were fed to groups of 30 chicks each.

The value of soybean oil meal in broiler rations, M. R. IRWIN and H. L. KEMPSTER (*Missouri Sta. Bul.* 441 (1942), pp. 16).—In 7 feeding trials with 42 lots of 630 chicks of the New Hampshire and Barred and White Rock breeds fed to 10 weeks of age comparisons were made of rations with 17.3–22 percent crude protein supplied from different sources. The results showed that rations containing soybean meal to the extent of 25 percent of the total ration produced gains equal in amount and efficiency to those produced by a control ration in which the proteins were supplied from different sources. As the sole protein feed to supplement soybean meal, meat scrap proved superior to dried buttermilk. The best growth and efficiency of production of ♂s and ♀s were obtained by a ration containing 20 percent protein from alfalfa meal, meat scrap, dried buttermilk, and soybean meal. These results suggest that a combination of proteins from various sources is more satisfactory as a protein supplement than proteins limited to two sources.

Vitamin needs of poultry, R. M. BETHKE (Ohio Expt. Sta.). (*U. S. Egg and Poultry Mag.*, 48 (1942), No. 2, pp. 73–76, 126, figs. 6).—A summary of our knowledge concerning the role of 4 fat-soluble vitamins and 12 water-soluble factors necessary in poultry nutrition.

Laying fowl and growing chickens require vitamin A, B. J. SENIOR and E. J. SHEEHY (*[Irish Free State] Dept. Agr. Jour.*, 38 (1941), No. 2, pp. 374–381).—The inclusion of green feed in the form of fresh material or dried grass seemed necessary for the laying hen on rations in which the vitamin A was curtailed. The number of eggs laid per pullet in a year's test showed that those receiving 10 and 20 parts of grass meal or 30 parts of yellow corn meal in place of all or part of the oats or barley meal in a basal mash ration produced averages of 80.7, 79.8, and 86.6 eggs per bird, respectively, as contrasted with 62.6 eggs per bird on the basal ration which included barley, wheat, and oats. There were 16 deaths ascribed to vitamin A deficiency among 32 pullets starting on the control ration. Irregularities in the A storage in the liver of different birds not receiving a source of vitamin A in the diet were noted, but when A was furnished the livers of all birds contained vitamin A. There were no appreciable differences in the growth rate of 35 chicks per group receiving vitamin A from yellow corn meal, grass meal, or both. Considerable quantities of vitamin A were found in the livers of representative birds slaughtered when the test was completed. No vitamin A was found in the livers of chicks receiving rations deficient in this vitamin. In another experiment 5 percent grass meal incorporated in the mash or 1 percent cod-liver oil supplied sufficient A for chicks, but analyses of the livers showed that there was not as great a storage as when 10 percent of grass meal was included.

The effect of ethyl alcohol and tricresol on the vitamin A content of the blood and liver of the chicken, W. A. MAW and N. NIKOLAICZUK (*Canad. Jour. Res.*, 20 (1942), No. 2, Sect. D, pp. 47–49).—Studies of the vitamin A and carotene in the livers and blood of 10-week-old chicks following 21 days intramuscular injection with $\frac{1}{2}$ cc. of 15 percent ethyl alcohol twice daily showed significant reductions in both products in the liver as compared with a group similarly injected with distilled water. Tricresol at 0.1 and 1.0 percent levels

had no appreciable effect on the blood or liver, vitamin A, or carotene, but prompted 30 percent greater gains in body and liver weights. The carotenoid content of the shank skin was greatly reduced by alcohol and trisecol.

The relation of riboflavin to growth and curled-toe paralysis in chicks, R. M. ВЕТНЕМ and P. R. RECORD. (Ohio Expt. Sta.). (*Poultry Sci.*, 21 (1942), No. 2, pp. 147-154).—In further studies on the prevention of curled-toe paralysis in chicks (E. S. R., 77, p. 684) no significant difference was noted either in growth response or the control of curled-toe paralysis between natural or synthetic sources of riboflavin. In addition to the basal ration of yellow corn, wheat, casein, minerals, and cod-liver oil, somewhat more than 20 μ g. and less than 40 μ g. of riboflavin per day per chick were required to prevent curled-toe paralysis, and probably for optimum growth. Additions of 250 μ g. of synthetic riboflavin or 3 gm. of dried pork liver per 100 gm. of ration promoted normal growth and prevented curled-toe paralysis to 8 weeks of age. Extracts of liver treated with fuller's earth did not prevent the curled-toe paralysis, but with riboflavin supplement normal growth was permitted with freedom from curled-toe paralysis. In feed-controlled experiments additions of liver residue to rations including riboflavin increased the weights obtained at 6 weeks even beyond those attained with a rice bran concentrate. These results indicated that curled-toe paralysis is an evidence of riboflavin deficiency and is not due to some other growth factor present in the liver. In another experiment in which graded amounts of synthetic riboflavin were added to basal rations assayed on rats there was found to be no great difference in the requirement of riboflavin of White Leghorn and Barred Rock $\delta \times$ New Hampshire Q chicks for growth or prevention of curled-toe paralysis. More riboflavin was required to prevent curled-toe paralysis than was needed for normal growth. The riboflavin requirement was estimated at 250 μ g. for normal growth and somewhat over 300 μ g. per 100 gm. of ration to prevent the paralysis symptoms.

Use of ultraviolet light on the laying flock, J. A. DAVIDSON and D. E. WIAIT (*Michigan Sta. Quart. Bul.*, 24 (1942), No. 3, pp. 248-252).—In a comparison of irradiation from sun lamps and cod-liver oil rations for egg production and hatchability in 1936-37, the S-1 lamp, which was equivalent to the S-4 lamp used by Kennard and Chamberlin (E. S. R., 86, p. 519), was too expensive. In another experiment in 1940-41 with 2 lots of 116 White Leghorn pullets nearly equal results in egg production, fertility, and hatchability were obtained with cod-liver oil fed at the rate of 1.5 percent of the feed consumed and the S-1 lamp operated 2 hr. per day.

Interference of heated diets with calcification in chickens, J. C. HAMMOND, D. MILLER, and H. E. McCLURE. (U. S. D. A.). (*Poultry Sci.*, 21 (1942), No. 2, pp. 185-188).—Rations complete in other respects but deficient in phosphorus were found to produce tibias low in ash without exhibiting external manifestations of rickets. In three experiments, lots of 25 Rhode Island Red chicks each were fed for 4 weeks on a diet of corn, wheat products, and casein heated to 100° C. for 6 days and supplemented with cod-liver oil, yeast, etc. These rations were amplified with various substances in a total of 23 lots. It was found that the ash content of the tibias was improved by the addition of tricalcium phosphate or steamed bone meal to the ration. Keel bone scores and ash contents of the tibias were generally improved by choline, calcium pantothenate, and paraaminobenzoic acid additions to the diet.

Rate of growth as a factor in the incidence of gizzard erosion in chicks, E. T. HALMAN (*Poultry Sci.*, 21 (1942), No. 2, pp. 189-192).—Not a single case of gizzard erosion was found in a lot of 26 crossbred chicks raised to 5 weeks of age on a basal cereal ration containing 10.56 percent protein, whereas gizzard

erosion occurred in 100 percent of similar chicks fed the same basal ration to which was added vacuum dried whale meal or ordinary ship's whale meal sufficient to make the protein content slightly over 17 percent. Although Almquist and Stokstad (E. S. R., 77, p. 676) have shown that the antigizzard-erosion factor is not vitamin K, the consumption per unit of gain of this vitamin was less with the whale meal diets than on the standard ration. The gizzard erosion was considered due to the increased growth rate and therefore the consequent reduction in the vitamin K available per unit of gain.

The influence of diets high and low in protein on the growth rates of chickens infected with the tapeworm, *Raillietina cesticillus*, G. W. LUTTERMOSE and R. W. ALLEN. (U.S.D.A.). (*Poultry Sci.*, 21 (1942), No. 2, pp. 111-115, fig. 1).—In three experiments chicks experimentally infected with the tapeworm, *R. cesticillus*, at 14-18 days of age did not differ markedly in weight at 6 weeks from uninfected controls on a ration containing 26 percent protein. However, the infected chicks made smaller gains than controls on a 13 percent protein ration. The results were based on lots of 10-11 infected and control chicks in each experiment.

Size of thymus and bursa Fabricius in relation to rate of growth in chicks, J. C. HAMMOND and H. R. BIRD. (Md. Expt. Sta. coop. U. S. D. A.). (*Poultry Sci.*, 21 (1942), No. 2, pp. 116-119).—Thymus glands and bursas of *Fabricius* removed from rapidly growing chicks at 14 days of age were found to be several times as large in proportion to body weight as those removed from slower-growing chicks of the same age. It was also noted that the proventriculi of the smaller chicks were larger in proportion to body weight than in the larger chicks. Similar results were found in the endocrines and portions of the digestive tract removed after 14-16 days' feeding. Removal of the thymus glands from day-old chicks did not hinder their rate of growth or development.

DAIRY FARMING—DAIRYING

[Investigations with dairy cattle and dairy products in Iowa] (*Iowa Sta. Rpt. 1941, pt. 1, pp. 96-97, 104-107, 137-150, figs. 4*).—Progress reports (E. S. R., 85, p. 238) of experiments with dairy cattle by J. L. Lush, C. Y. Cannon, E. N. Hansen, D. L. Espe, and E. W. Bird include the persistency and inheritance of milk and fat production among cows in Iowa cow-testing association herds, the influence of the physical properties of milk on its rate of digestion in vivo, the comparative value of dairy rations consisting of roughage alone v. roughage and a limited amount of grain v. roughage and full-grain feeding, and the effect of feeding soybeans and soybean products alone and in combination with other feeds on milk production and milk and butterfat quality.

From investigations with dairy products, results are noted on the significance of *Pseudomonas putrefaciens* in the development of surface taint in butter, and the distribution and common sources of this organism; the effect of ozonation of water supplies on bacterial flora; the distribution of salt in commercial butter; the comparative phosphatase activity of skim milk, whole milk, cream, and butter; the development of butter cultures from mixtures of organisms; methods of preparing butter cultures for mail shipment; and the distribution of diacetyl and acetylmethylcarbinol between the fat and serum phases of butter, all by B. W. Hammer; the mechanism of the dissimilation of the carbon sources in butter and cheese cultures, by Hammer and C. H. Werkman; the role of lipolytic enzymes in the ripening of Cheddar and blue cheeses, by C. B. Lane and Hammer; the kinds of acids in butter and the distribution of these acids between the water and fat phases of butter, and the effect of neutralizers on

the fat losses in buttermilk and the quality of the butter, both by Bird; the use of continuous vacuum-pasteurization process for improving the quality of cream intended for buttermaking, by N. E. Fabricius; the effect of the pH of the serum of sweet cream butter on its keeping quality, the methods of manufacturing butter of satisfactory characteristics for packaging, both by Bird and Fabricius; and the standardization of Iowa dairy products, and the determination of butterfat losses in the Iowa creameries, both by M. Mortensen.

[Pasture and silage crop investigations in Maine] (*Maine Sta. Bul.* 405 (1941), pp. 459-462).—Results are presented on the returns as pounds of milk per acre secured from old permanent pastures receiving various applications of mineral fertilizers or manure and the effects of these treatments on the botanical and chemical composition of the herbage, by D. S. Fink and P. Mosher; and a comparison of methods for ensiling a Ladino clover-timothy mixture, involving various degrees of drying before ensiling and the use of molasses and phosphoric acid as preservatives, by Fink and B. E. Plummer, Jr.

Management practices and returns on white clover pastures, E. VANDER MEULEN, G. MCINTYRE, and C. M. HARRISON (*Michigan Sta. Quart. Bul.*, 24 (1942), No. 3, pp. 233-238, figs. 3).—General recommendations for improving white clover pastures of the region include liberal applications of phosphatic fertilizer, relatively close grazing, and clipping as necessary to control weeds and other undesirable species. Data on returns from white clover pasture in terms of milk production indicate that pasture production frequently can be doubled and more nutritious palatable feed produced by proper pasture management.

Various oils and fats as substitutes for butterfat in the ration of young calves, T. W. GULLICKSON, F. C. FOUNTAINE, and J. B. FITCH. (*Minn. Expt. Sta.*). (*Jour. Dairy Sci.*, 25 (1942), No. 2, pp. 117-128, figs. 2).—Butterfat, lard, tallow, coconut oil, peanut oil, corn oil, cottonseed oil, and soybean oil were compared as sources of fat in the ration of young calves. Each fat was homogenized in skim milk to give a product containing 3.5 percent fat and was fed with a low-fat concentrate mixture, cod-liver oil, and alfalfa hay. A check group received normal whole milk and another a very fat-poor diet. The calves receiving butterfat exceeded all others in general well-being and in average daily gains, with those receiving whole milk and the butterfat mixture gaining 1.43 and 1.22 lb. per day, respectively. The groups fed lard or tallow followed closely, with average daily gains of 1.17 and 1.24 lb., respectively. Corn oil, cottonseed oil, and soybean oil were least satisfactory, these respective mixtures supporting average daily gains of 0.40, 0.31, and 0.32 lb. The calves in these groups appeared unthrifty, listless, and emaciated, and mortality was high. Post mortem examination showed more fat to be deposited in calves fed butterfat than in those fed other oils or fats.

The introduction of cattle into Colonial North America, G. A. BOWLING. (*W. Va. Expt. Sta.*). (*Jour. Dairy Sci.*, 25 (1942), No. 2, pp. 129-154).—An interesting review, with 55 references to the literature.

The history of Channel Island cattle: Guernseys and Jerseys, E. P. PRENTICE (*Williamstown, Mass.: McClelland Press*, 1940, pp. 100+[2], figs. 15).—A concise history based on an extensive search of information on the subject.

Repeatability of type ratings in dairy cattle, L. E. JOHNSON and J. L. LUSH. (*Iowa Expt. Sta.*). (*Jour. Dairy Sci.*, 25 (1942), No. 1, pp. 45-56).—Type ratings were made annually from 1930 to 1940 on the college Holstein-Friesian dairy herd, both by official judges and by members of the station staff. The repeatability of type ratings of an individual was roughly similar to that of

her intraherd production records. Omitting ratings made at 10 mo. of age or less, the repeatability of type was 0.34 in the judges' ratings and 0.55 in the station ratings. Consecutive ratings were only slightly, if any, more alike than ratings separated by 2, 3, or 4 yr. Changes in the udder and in the health of the cow appeared to be the chief causes of large shifts in type ratings. Two ratings had an advantage over one for predicting future type, but little was gained in using more than two.

Accuracy of live weights of dairy cows on pasture, R. E. HODGSON and J. C. KNOTT. (Wash. Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 2, pp. 161-167; *abs. in Jour. Anim. Sci.*, 1 (1942), No. 1, p. 67).—In connection with a pasture grazing experiment, live weights were taken on the 2 days preceding and the first day of the grazing period (initial weight) and on the last 2 days of the grazing period and the day following (final weight). By analysis of variance it was shown that the average experimental error of live weight on 3 successive days was 14.0 lb., with a range in group weights from 7.0 to 28.3 lb. The standard deviation of day-to-day changes in the weight of the groups of cows averaged 7.7 lb., while the average standard error in the weights of 1,200-lb. cows was only 2.2 lb. It is concluded that this method of weighing accurately measured the live weights of the cows.

Age, live weight, and milk-energy yield—A correction, W. L. GAINES, C. S. RHODE, and J. G. CASH. (Univ. Ill.). (*Jour. Dairy Sci.*, 25 (1942), No. 1, pp. 15-18, fig. 1).—A correction of an article previously noted (E. S. R., 84, p. 385), with particular reference to a more accurate method of estimating live weight (E. S. R., 86, p. 521).

Growth and development, with special reference to domestic animals.—LIII, Resting energy metabolism and ventilation rate in relation to body weight in growing Jersey cattle, with a comparison to basal energy metabolism in growing man, S. BRODY, H. H. KIBLER, and A. C. RAGSDALE (*Missouri Sta. Res. Bul.* 335 (1941), pp. 20, figs. 8).—Continuing this series (E. S. R., 85, p. 801), data are presented on the resting oxygen consumption and ventilation rate of growing Jersey cattle based on periodic observations on 18 individuals from birth to 25 mo. of age. The computed average resting metabolism, i. e., Calories per day, of heifers under 6 mo. of age equaled $88.3 W^{0.75}$ and of heifers 6 to 25 mo. of age $295 W^{0.75}$, in which W is live weight in kilograms. Since the relationship of surface area to live weight has been found to be quite consistent at all ages, the resting metabolism per square meter of body surface apparently increased from about 1,300 Calories at birth to about 2,000 Calories at 6 mo., at which level it remained up to 25 mo., or the middle of the first gestation period. Comparable data on the relationship between metabolism and body weight of growing man are included.

New developments in the physiology and biochemistry of lactation: A review, W. E. PETERSEN. (Minn. Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 1, pp. 71-96).—Three principal topics are covered in this review: (1) Development of the mammary glands, (2) lactation, and (3) ejection of milk from the smaller gland recesses. Included are 270 references to the literature.

Mammary gland development with mammogen I in the castrate and the hypophysectomized rat, A. A. LEWIS, E. T. GOMEZ, and C. W. TURNER. (Mo. Expt. Sta. and U. S. D. A.). (*Endocrinology*, 30 (1942), No. 1, pp. 37-47, fig. 1).—A lipid mammogen I extract of anterior pituitary gland of pregnant cattle, extracted by the method described (E. S. R., 82, p. 758), when administered to hypophysectomized male and female rats for 7-10 days in dosages ranging from 4 to 16 mammogen units per day definitely caused growth of

the mammary duct system. Similar responses were obtained by injection of the hormone into castrate male rats. The effect of such treatment on certain other organs is indicated.

Size of the rabbit mammary gland with successive lactations, A. A. LEWIS and C. W. TURNER. (Mo. Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 1, pp. 57-58).—By marking, with tattooed lines in the skin, the lateral extent of the mammary glands of rabbits early in their first lactation period and then observing the animals during the succeeding lactations, it was found that the gland rarely extended past the tattooed lines in the second, third, or fourth succeeding lactation. It is pointed out that these almost uniformly negative results do not preclude the possibility that the thickness and density of the mammary glands may have increased.

Influence of environmental temperature on growth of mammary lobule-alveolar system, J. P. MIXNER and C. W. TURNER. (Mo. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 2, pp. 443-445).—Using an assay technique previously described (E. S. R., 86, p. 671), it was found that spayed virgin mice kept at a temperature of 35° C. had a decreased ability to respond to progesterone and oestrone injections with mammary lobule-alveolar growth as compared with similarly treated controls kept at a more normal temperature of 25°. This same high temperature did not inhibit this response in animals injected with a pituitary extract containing the mammogenic lobule-alveolar growth factor which directly stimulates mammary gland growth.

Influence of lactogenic preparations on mammary glands and time of vaginal opening in young rats, W. R. LYONS, M. E. SIMPSON, and H. M. EVANS. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 3, pp. 634-637, fig. 1).—The subcutaneous administration of lactogenic hormones in doses from 0.5 to 2.0 mg. daily to female rats, beginning at 21 days of age, did not delay but rather tended to slightly advance the day of vaginal opening. Continued administration of the hormone resulted in continuous vaginal mucification and in lobular development of the mammary gland.

Mammary growth in hypophysectomized male mice receiving estrogen and prolactin, W. U. GARDNER and A. WHITE (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 3, pp. 590-592).—Hypophysectomized male mice, when injected with either of two preparations of highly purified prolactin at either of two dosage levels, showed no evidence of mammary growth, but growth of the rudimentary glands was stimulated in individuals receiving either of the prolactin preparations plus oestrogen.

Effect of stilbestrol on lactogenic content of pituitary and mammary glands of female rats, A. A. LEWIS and C. W. TURNER. (Mo. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 2, p. 439-443).—Following earlier studies on the effect of oestrogenic substances on the lactogenic content of the pituitary gland (E. S. R., 78, p. 323), it was found that the subcutaneous injection of stilboestrol into mature spayed rats for 10 days caused an increase of as much as 226 percent in the lactogenic content of the pituitaries per 100 gm. of body weight and caused serous or milk secretion from partially developed lobule-alveolar glands.

Failure of steroid hormones to induce mammary growth in hypophysectomized rats, S. L. LEONARD and R. P. REECE. (N. J. Expt. Stas.). (*Endocrinology*, 30 (1942), No. 1, pp. 32-36).—Following this line of investigation (E. S. R., 86, p. 670), experiments were conducted which gave evidence that desoxycorticosterone, alone or in combination with oestrogen, and testosterone, alone or in combination with desoxycorticosterone or oestrogen, when injected into hypophysectomized male rats failed to induce new growth in the mammary

gland. Also the administration of oestrogen directly on the skin over the mammary gland of hypophysectomized female rats failed to stimulate growth of the skin. "These experiments further the concept that pituitary mammogen is essential for steroid hormone effects on the mammary glands of hypophysectomized rats."

The effect of thiol compounds on the activity of lactogenic hormone, H. FRAENKEL-CONRAT, M. E. SIMPSON, and H. E. EVANS. (Univ. Calif.). (*Jour. Biol. Chem.*, 142 (1942), No. 1, p. 107-117).—Continuing this line of investigation (E. S. R., 83, p. 184; 85, p. 297), purified lactogenic hormone preparations were treated with varying concentrations of cysteine and thioglycolic acid. Treatment with more than two-hundred-fold amounts of cysteine caused true inactivation of the hormone, whereas lower concentrations of cysteine led to an apparent inactivation by causing transformation of the hormone into a very insoluble state. When this insoluble protein was redissolved without autooxidation, it was as active as the untreated hormone. No inactivation occurred if formation of a precipitate was avoided by performing the cysteine treatment in dilute protein or urea solutions. Thioglycolic acid proved to be approximately 50 times more effective than cysteine in causing true inactivation of the lactogenic hormone, although similar amounts of the two preparations caused precipitation of the protein.

The effect of thiols on the reducing groups of lactogenic hormone, H. FRAENKEL-CONRAT. (Univ. Calif.). (*Jour. Biol. Chem.*, 142 (1942), No. 1, pp. 119-127).—In further tests, treatment of lactogenic hormone with thiol compounds caused (1) "the reduction of disulfide bonds to cysteine thiol groups, (2) the appearance of groups of unknown nature which reduce phosphotungstate and ferricyanide in neutral solution, and (3) the probable formation of stable addition compounds between the protein and the thiol compound." Thioglycolic acid was found to cause about twice as much reduction as an equivalent amount of cysteine.

The effect of progressive iodination on the thyroidal activity of iodinated casein, E. P. REINEKE, M. B. WILLIAMSON, and C. W. TURNER. (Mo. Expt. Sta.). (*Jour. Biol. Chem.*, 143 (1942), No. 1, pp. 285-293, fig. 1).—By methods described, both skim milk and casein were iodinated with varying amounts of iodine to give from 2.2 to 8.8 percent iodine in the dialyzed iodoprotein. The thyroidal activity of the iodoproteins as assayed both with guinea pigs and tadpoles was found to be at a maximum when from 4.5 to 5 atoms of iodine had been added per mole of tyrosine in the protein, or an amount sufficient to substitute 2 atoms of iodine on the tyrosine ring. Further iodination consistently resulted in a significant decrease in thyroidal activity. It appeared that the method of iodination used favored substitution on the tyrosine ring, with little or no substitution in other parts of the protein molecule.

The anatomy and physiology of the teat sphincter, D. ESPE and C. Y. CANNON. (Iowa Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 2, pp. 155-160, figs. 3).—Careful observations of the teats before and after both hand and machine milking, the determination of intrateat pressure, and X-ray photographs of the teat canal containing barium were made in this study, with particular attention to factors involved in udder infections entering through the teat. The evidence failed to indicate that a negative pressure develops at the external orifice of the teat when the pressure of milking is released. There was a greater tendency for the teat sphincter to show injury after machine milking than after hand milking. It is concluded that a teat whose sphincter becomes eroded at the external orifice seems to offer a greater opportunity for infection of that quarter than one which shows no erosion.

Overcoming seepage of bottled homogenized milk, G. M. TROUT (*Michigan Sta. Quart. Bul.*, 24 (1942), No. 3, pp. 217-227, figs. 7).—From a study of various factors involved in the problem of "leaky caps" in bottled homogenized milk, data are presented to show that (1) there is no significant difference in the expansion of homogenized and unhomogenized milk at 70° F. or in the rate of temperature change of the two milks under uniform temperature exposure, (2) homogenization slightly increases the capillarity of milk, the amount of increase being directly related to homogenization pressure, and (3) homogenized milk is more readily absorbed by blotting paper than unhomogenized milk. Overfilling the bottle is shown to be the primary cause of this trouble, and the problem is more acute with the 48-mm. neck bottle than with the 56-mm. bottle. Other precautions include proper refrigeration during delivery to prevent undue expansion and careful handling to prevent the milk coming in contact with the cap so far as possible.

A proposed score grade method of determining the quality of milk, P. A. DOWNS. (Nebr. Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 2, pp. 103-109).—A simplified milk-scoring method providing for score grades, expressed as whole numbers ranging from 85 to 93, inclusive, is described.

Some farm procedures that affect the bacteria count of milk, C. S. BRYAN, E. D. DEVEREUX, W. L. MALLMANN, G. J. TURNER, L. H. BEGEMAN, and B. L. GILBERT (*Michigan Sta. Quart. Bul.*, 24 (1942), No. 3, pp. 205-210).—This discussion emphasizes healthy clean cows, the use of clean sanitized utensils, and proper cooling and storage as essentials in the production of high-quality milk. Data substantiating these recommendations are included.

Superheated soft curd milk, J. L. DIZIKES and F. J. DOAN. (Pa. Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 1, pp. 37-44).—The process developed for the production of superheated soft-curd milk consists in preheating or pasteurizing a high-grade milk of average composition for a suitable length of time, followed by condensing in a vacuum pan to a concentration of 3:1. The product is then superheated, either in the vacuum pan or after withdrawing, to a temperature between 180° and 205° F. and held until definite flaking occurs. The milk is then cooled to about 160° and mixed with water of the same temperature to bring the composition back to that of the original milk, after which it is homogenized at 3,000 lb. pressure and packaged. In vitro digestion trials indicated this product to be as digestible as evaporated milk and only slightly less digestible than acidified milk which is properly acidified to the isoelectric point. It is low in sedimentation and has a cooked but not caramelized flavor. Such milk is believed to be particularly suitable for infant feeding, since it includes none of the objectionable features involved in certain other methods advocated for the production of soft-curd milk.

Distribution of diacetyl and acetylmethylcarbinol between fat and water, with special reference to butter, W. H. HOECKER and B. W. HAMMER. (Iowa Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 2, pp. 175-185).—The distribution of diacetyl and acetylmethylcarbinol, when present in varying concentrations, in mixtures of vegetable oil with water or brine, or in butterfat with water or brine, was compared with the distribution of these ingredients between the serum and fat phase of both salted and unsalted butter. Both the serum and fat of the butters were found to contain both acetylmethylcarbinol and diacetyl, with the serum containing the higher concentration of each. In both salted and unsalted butter, a higher percentage of the total diacetyl than of the total carbinol was contained in the fat. The distribution of diacetyl was similar in butter to which a solution of this compound or starter distillate was added and in butter made from cream containing a butter culture. Similar results

were obtained with the mixtures of fat with water or brine. The addition of salt in the mixtures or in butter tended to increase the concentration of both compounds in the fat. The concentration of diacetyl in the mixtures or in butter had no apparent effect on the percentage contained in the fat, but as the concentration of the carbinol increased the percentage in the fat decreased. Distribution was similar in mixtures held at 4° C. after 30 days as after 7 days.

Further studies on the use of salt for improving the quality of cream for buttermaking, F. E. NELSON, W. J. CAULFIELD, and W. H. MARTIN. (Kans. Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 1, pp. 59-70).—Further tests with cream containing 10 or 13 percent salt have largely confirmed previously reported findings (E. S. R., 84, p. 667) in showing that such quantities of salt are markedly beneficial in increasing the quality of the cream and butter made therefrom. A practical procedure was to place all of the salt in the container at the beginning of the accumulation period and then add cream in daily increments with thorough stirring after each addition. The addition of salt completely inhibited yeast and mold growth and greatly reduced the number of bacteria, which were limited mainly to large paired and clumped cocci and a few sarcina types. The use of salt was found to cause noticeable corrosion on tinned copper and other common dairy metals but was noncorrosive to stainless steel.

Factors influencing bacterial growth in butter, B. W. HAMMER and H. F. LONG. (Iowa Expt. Sta.). (*Bact. Rev.*, 5 (1941), No. 4, pp. 337-374).—A comprehensive review, with 114 references to the literature.

The effect of natural milk enzymes, acid, and salt upon the keeping quality of butter stored for six years, B. J. SCHEIB, C. N. STARK, and E. S. GUTHRIE. (Cornell Univ. et al.). (*Jour. Dairy Sci.*, 25 (1942), No. 1, pp. 25-30).—Following an earlier study of butters examined after a brief storage period (E. S. R., 75, p. 839), duplicate samples of the same lots of butter have been examined for quality after 6 years' storage at 0° to -10° F. Five series of butters were included to permit a study of the harmful effects of natural milk enzymes, acid, salt, and acid and salt upon the keeping quality of the butter. The harmful natural milk enzymes had been entirely inactivated by the pasteurization of the cream at 165° for 30 min., whereas pasteurization at 145° for 30 min. was apparently only about 80 percent effective. The presence of either acid or salt in the butter resulted, after prolonged storage, in a poorer quality butter. The combined deteriorating effect of acid and salt was approximately four times as great as that of salt alone. In an effort to evaluate the relative importance of these factors, it appeared that the relationship between the spoilage factors of salt, acid, both acid and salt, and the natural milk-spoilage enzymes was approximately 1:3:4:6.

The reversibility of oxidative inactivation of milk lipase in relation to its activity in Cheddar cheese, I. HLYNKA and E. G. HOOD (*Jour. Dairy Sci.*, 25 (1942), No. 2, pp. 111-115).—This contribution from the Canadian Department of Agriculture describes experiments on the reversibility of oxidative inactivation of milk lipase under three oxidation-reduction systems. Deaeration of copper-free milk, even after aeration, was found to protect lipase from oxidation, but deaeration of aerated milk gave no protection to the lipase when copper was present, indicating that an anaerobic environment may bring about some reversibility of oxidatively inactivated milk lipase but not in the presence of copper. The addition of ascorbic acid to the system either before or after aeration of the milk gave erratic results, suggesting that either ascorbic acid cannot reduce oxidized lipase or is too readily destroyed to be an effective

reducing agent under the experimental conditions. The addition of cysteine, with or without copper and before or after aeration, induced greater lipolytic activity, leading to the conclusion that cysteine can reverse the inactivation of milk lipase brought about by aeration or by aeration and copper.

Identification of the white particles found on ripened Cheddar cheese, F. L. DORN and A. C. DAHLBERG. (N. Y. State Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 1, pp. 31-36, figs. 2).—A series of chemical tests on the white particles obtained from ripened Cheddar cheese led to the conclusion that this material is principally tyrosine.

Modern Limburger cheese makers use exceptional care, M. W. YALE (*Farm Res.* [New York State Sta.], 8 (1942), No. 2, pp. 6-7, 19, figs. 7).—A description of Limburger cheese-manufacturing processes, with comments concerning a typical New York State factory.

Study properties of evaporated milk, J. C. MARQUARDT (*Farm Res.* [New York State Sta.], 8 (1942), No. 2, p. 8, figs. 4).—This brief report of research indicates that remade evaporated milk is a homogeneous product which will not separate into layers of different composition on standing, and that it has a low curd strength comparable to that of homogenized whole milk.

A comparison of hot water, steam, and chlorine for sanitizing ice cream freezers, F. W. FABIAN, A. E. HOOK, G. L. NIELSEN, and G. J. TURNER. (Mich. Expt. Sta. et al.) (*Jour. Dairy Sci.*, 25 (1942), No. 1, pp. 1-13).—In all trials reported a standard freezer-cleaning method was followed, consisting of (1) a clear water rinse at 60° F., (2) a detergent rinse at 140°, and (3) a clear water rinse at 180°. Without reference to final sanitization, the amount of water used to rinse the freezer was found to have a direct relationship to the number of bacteria remaining in the freezer. A comparison of a chlorine rinse, steam, and a hot-water rinse for final sanitizing of the freezer, as measured by the total bacterial count and *Escherichia coli* count of sterile rinse water after sanitizing, showed them to rank in the order given. The relative inefficiency of hot water is explained by the fact that under the most favorable conditions water entering the freezer at 200° had a temperature of only 111° after 2 minutes' agitation. For sanitizing the front and rear bearings of the freezer steam proved most effective, followed in order by chlorine rinse and hot-water rinse.

VETERINARY MEDICINE

[Work in animal pathology by the Iowa Station] (*Iowa Sta. Rpt.* 1941, pt. 1, pp. 110, 113-116).—Reports of progress (E. S. R., 85, p. 247) of work by C. D. Lee, C. Murray, H. L. Wilcke, J. W. Gowen, and A. J. G. Maw are given on the etiology of range paralysis in poultry; utilization of radiant energy in the study of the etiological agent of fowl leucosis; association of the so-called nonspecific enteritis of chickens with fowl leucosis; the mode of inheritance of resistance to fowl leucosis; transmission of the iritis type of fowl paralysis by egg, sperm, and inoculation; production of antibodies against the agent of fowl leucosis; and treatment of the chick with radiant energy and its effect on the course of fowl leucosis.

[Work in animal pathology and parasitology by the Puerto Rico University Station] (*Puerto Rico Univ. Sta. Rpt.* 1941, pp. 4, 36-38).—The progress of work (E. S. R., 86, p. 87) on cattle parasites and bloat colic in horses is reported upon by J. S. Andrews and J. F. Maldonado.

Nature of Elmeria nieschulzi growth-promoting potency of feeding stuffs.—II, Vitamins B₁ and B₂, E. R. BECKER and R. I. DILWORTH. (Iowa State Col.). (*Jour. Infect. Diseases*, 68 (1941), No. 3, pp. 285-290).—In further

investigation (E. S. R., 84, p. 524) it was found that when a particular ration somewhat restricted in vitamins B₁ and B₆ was used as a basal the addition of moderate amounts of thiamin chloride produced a reduction in the numbers of oocysts eliminated by rats inoculated with uniform dosage of *E. nieschulzi*. Supplementing with vitamin B₆ enhanced the yields of oocysts from infected rats. The addition of both vitamins B₁ and B₆ to the ration further reduced the quantity of oocysts passed below the level of the vitamin B₁ recipients. In this case, however, the treated rats made a much more variable response to the infection than did the untreated and vitamin B₁ series. Regardless of the ration and the numbers of oocysts eliminated, recovered rats were practically immune to reinfection.

The practical use of phenothiazine as an anthelmintic for large animals, I. S. MCADORY. (Ala. Polytech. Inst.). (*North Amer. Vet.*, 23 (1942), No. 3, pp. 182-183).

Phenothiazine as an anthelmintic for removal of gastrointestinal parasites of sheep and calves, L. E. SWANSON. (Univ. Fla.) (*North Amer. Vet.*, 23 (1942), No. 3, pp. 184-185).

Studies on the antibacterial action of the sulfonamide drugs, I, II (*Jour. Expt. Med.*, 75 (1942), No. 4, pp. 369-394, figs. 3).—This report of studies is presented in two parts.

I. *The relation of p-aminobenzoic acid to the mechanism of bacteriostasis*, W. B. Wood, Jr. (pp. 369-381).—The observations reported substantiate the theory that the sulfonamide drugs used in the treatment of bacterial infections exert their bacteriostatic effect by competing with the essential metabolite, *p*-aminobenzoic acid, for an important enzyme site on the bacterial cell. It was shown that *p*-aminobenzoic acid nullifies the bacteriostatic effect of all of the sulfonamide compounds studied, namely, sulfanilamide, diaminodiphenylsulfone, sulfaguanidine, sulfapyridine, sulfadiazine, and sulfathiazole, even though the drugs exhibited marked differences in chemical structure.

II. *The possible relation of drug activity to substances other than p-aminobenzoic acid*, W. B. Wood, Jr., and R. Austrian (pp. 383-394).—The findings reported failed to support the theory that sulfapyridine, sulfathiazole, and sulfadiazine prevent bacterial growth by interfering with the functioning of the chemically related coenzymes, cozymase, and cocarboxylase. The mode of action of sulfanilamide and its more common derivatives is discussed in the light of these observations, and a tentative theory is offered to explain the differences in bacteriostatic potency exhibited by the various sulfonamide compounds.

Some therapeutic indications for the use of sulfathiazole in small animal practice, A. H. BRYAN (*Vet. Med.*, 37 (1942), No. 3, pp. 138-140, figs. 3).—The use of sulfathiazole is considered justified as a standard procedure in dealing with distemper and other canine and feline infections.

Influence of diet on sulfanilamide toxicity, I. KAPNICK, C. LYONS, and J. D. STEWART (*Jour. Pharmacol. and Expt. Ther.*, 74 (1942), No. 3, pp. 284-289).—In the experimental work conducted a high protein (casein) diet protected rats being given large amounts of sulfanilamide suspended in acacia daily, as shown by better survival, weight gain, condition of coat, physical activity, and clinical appearance. Drug intolerance is increasingly apparent on the general maintenance, the high fat, and the high carbohydrate diets. An increased urine volume is associated with a greater elimination of sulfanilamide and a lower concentration of the drug in the blood of the rats on a high protein diet. It is suggested that the greater tolerance afforded by the high protein diet is due to some extent to a more rapid excretion of sulfanilamide.

Resistance to arsenic as displayed by the single host blue tick *Boophilus decoloratus* (Koch) in a localised area of the Union of South Africa.—Preliminary report, R. DU TOIT, H. GRAF, and P. M. BEKKER (*Jour. So. African Vet. Med. Assoc.*, 12 (1941), No. 2, pp. 50-58).—A report of observations of *B. decoloratus* which reveals a high degree of resistance or tolerance to sodium arsenite solutions at the concentrations used for dipping, namely 0.16 percent As_2O_3 (or 7-day strength) and 0.24 percent As_2O_3 (or 14-day strength).

Studies on sensitization: Its possible relationship to periodic ophthalmia, E. L. STUBBS and W. G. LOVE (*North Amer. Vet.*, 22 (1941), No. 9, pp. 539-542, fig. 1).

Two methods for the eradication of brucellosis or Bang's disease, H. SCHMIDT (*Texas Sta. Cir.* 94 (1941), pp. 11).—A practical account in which two methods for the eradication of Bang's disease from a herd are described. The first consists of the removal of all calves before they are 5 mo. of age from infected to clean premises, followed by proper management and care, and the second of the blood-testing of all animals in the herd and segregating and ultimately slaughtering all infected animals.

An overlooked macroscopic intestinal lesion of value in diagnosing bovine coccidiosis, D. C. BOUGHTON. (U. S. D. A.). (*North Amer. Vet.*, 23 (1942), No. 3, pp. 173-175, figs. 6).—Description is given of a characteristic lesion in the small intestine of bovines, considered of special diagnostic value in cases of coccidiosis which come to autopsy in the early stages of the disease before oocyst production. The similarity between this lesion and certain structures described but not identified with coccidiosis by several earlier workers is pointed out. The small, white, cystlike bodies found to dot the mucosa of the posterior half of the small intestine in fatal cases produced experimentally (E. S. R., 86, p. 827) are thought to be large asexual stages (schizonts) of one or more species of bovine coccidia, *Eimeria bovis* (= *E. smithi*) being the most likely one in the present instance.

"Eperythrozoonosis" in cattle in the United States, J. C. LOTZE and M. J. YIENGST. (U. S. D. A.). (*North Amer. Vet.*, 22 (1941), No. 6, pp. 345-346, fig. 1).—Brief report is made of the observation of *Eperythrozoon wenyonii* Neitz bodies in the blood of cattle experimentally infected with *Anaplasma marginale*.

Field experiments on keratitis in cattle, V. T. ROSE (*Jour. Amer. Vet. Med. Assoc.*, 100 (1942), No. 780, pp. 234-236).—In observations of 3,662 cattle treated with doses of keratitis bacterin it was found that three injections of 5, 10, and 15 cc. early in the spring before any infection had occurred gave an immunity that prevented the trouble during the summer months.

Listerella infection in a calf in North Wales, H. E. HARBOUR (*Vet. Jour.*, 97 (1941), No. 12, pp. 401-407).—Record is made of the isolation of a species of *Listeria* from the liver and lungs of a calf which died at the age of 9 days, following symptoms of severe diarrhea. Ulceration and hemorrhages in the abomasum and multiple necrotic foci in the liver were the chief lesions found present.

Scours in dairy calves, with special reference to white scours, coccidiosis, and verminous gastroenteritis, B. T. SIMMS, D. C. BOUGHTON, and D. A. PORTER. (U. S. D. A.). (*North Amer. Vet.*, 23 (1942), No. 3, pp. 176-181).

Liver fluke causes serious losses to sheep and cattle in the intermountain States, W. H. KRULL. (Coop. U. S. D. A.). (*Farm and Home Sci. [Utah Sta.]*, 3 (1942), No. 1, p. 14, figs. 3).—A practical discussion of the liver fluke *Fasciola hepatica* as applied to intermountain conditions. As an illustration of the importance of this parasite, it is pointed out that at the Logan, Utah, abattoir 867 of 2,364 cattle livers were condemned because of flukes. These condemnations

represented more than 9,500 lb. of liver, conservatively worth more than \$1,100, or an amount almost sufficient to cover the slaughtering costs.

Coccidia infesting the Rocky Mountain bighorn sheep in Wyoming, with descriptions of two new species, R. F. HONESS (*Wyoming Sta. Bul.* 249 (1942), pp. 28, figs. 5).—The importance of bighorn sheep as a source of parasite infection of domestic sheep led to the investigation here reported. Particular attention was given to the species of *Eimeria* infecting the sheep, it being found that they are identical with those infecting the domestic sheep, with the possible exception of *E. crandallis* n. sp. The size range for most of the species was found to be slightly greater in the bighorn. The identity was established by a morphological study, no cross-infection experiments having been undertaken. While the pathogenicity of several species has been well established for the domestic sheep, little is known concerning their effect upon the bighorn sheep. It is pointed out that only in a few instances was a single collection of droppings from a bighorn sheep free of coccidial oocysts. In several fecal samples from adult sheep oocysts were as abundant as in cases of subacute coccidiosis of domestic lambs. In this study 1,346 oocysts were measured from the bighorn and 367 oocysts from the domestic sheep for comparison. Two new species of *Eimeria* are described, namely, *E. ah-sa-ta*, found in both the bighorn and the domestic sheep, and *E. crandallis*, thus far found only in the bighorn sheep.

Foot-rot in sheep: A transmissible disease due to infection with *Fusiformis nodosus* (n. sp.)—Studies on its cause, epidemiology, and control, W. I. B. BEVERIDGE (*Austral. Council Sci. and Indus. Res. Bul.* 140 (1941), pp. 56, pls. 8).—Report is made of the finding that flocks of sheep free of foot rot infection will remain free of the disease indefinitely even when grazing on lush wet pasture which in the past has been regarded as most favorable for the development of the disease. Eradication of foot rot from several large flocks has been successfully carried out by stock owners during dry seasons.

Effectiveness of certain "worm remedies" on worm-infested feeder lambs, A. C. SEARS and J. H. LONGWELL (*North Dakota Sta. Bimo. Bul.*, 4 (1942), No. 4, pp. 20-22).—Comparative tests were made of the value of the administration of (1) copper sulfate, 3 oz. of 1.5 percent solution, (2) phenothiazine, 15 gm. in capsules, and (3) tetrachloroethylene, 5 cc., each repeated at intervals of 3 weeks for three doses, in the treatment of affected feeder lambs. These lambs, which came from two infected flocks, received a treatment of Kamala (2 dr.) for the removal of tapeworms and were fed the same grain ration. The data presented show gains averaging 0.5 lb. per lamb daily, the amounts of feed required per 100 lb. gains being similar. All three treatments reduced the worm egg count appreciably. Post-mortem examination of the stomach and intestines showed a medium to heavy infestation of stomach worms in the untreated lot, with light to no infection in the treated lots. The hemoglobin was low at the beginning of the treatment, but increased to normal after the lambs were on full feed. No evidence was found that phenothiazine reduced the hemoglobin. The gains made by the untreated lambs were surprisingly high, with low feed cost, considering the numbers of stomach and tapeworms present. This rapid and economical gain is mainly attributed to the amount and quality of feed consumed.

Chronic swine erysipelas, G. C. HOLM, R. L. GRIFFITH, JR., and W. M. BEESON. (Idaho Expt. Sta.). (*Vet. Med.*, 37 (1942), No. 3, pp. 123-127, figs. 5).—It is shown that through strict sanitation together with a program of eradication the chronic form of swine erysipelas can be controlled. It is pointed out that not all cases of arthritis are due to swine erysipelas, but may result from injury, omphalitis, rickets, or swine brucellosis.

Phenothiazine poisoning in pigs, W. M. THORNING, C. C. MORRILL, and L. E. BORLEY. (Univ. Ill.). (*Vet. Med.*, 37 (1942), No. 3, pp. 120-122, figs. 4).—Report is made of poisoning in swine resulting from the treatment for worms with an overdose of phenothiazine. The symptoms included incoordination, posterior paralysis, and corneal opacity. Two of 112 affected animals succumbed.

Nutritional diseases of the equine, W. W. DIMOCK and B. J. EBRINGTON. (Ky Expt. Sta.). (*North Amer. Vet.*, 23 (1942), No. 3, pp. 152-157).

Studies on equine encephalomyelitis.—III, Non-pathogenicity for chicks of western equine encephalomyelitis virus, N. D. LEVINE and R. GRAHAM. (Univ. Ill.). (*Vet. Med.*, 37 (1942), No. 3, pp. 116-117, fig. 1).—In continuing these studies (E. S. R., 87, p. 117), 2- to 3-week-old chicks were found refractory to infection with two strains of western equine encephalomyelitis virus under the experimental conditions employed.

Minnesota's experience with human encephalitis caused by the equine type of virus in 1938, C. M. EKLUND and A. BLUMSTEIN. (Univ. Minn. et al.). (*Minn. Med.*, 25 (1942), No. 2, pp. 103-107).—This contribution, presented with a list of 35 references to the literature, records 14 cases of encephalitis with neutralization of the western strain of equine encephalomyelitis virus and briefly describes the epidemiologic and clinical features.

Recent experimental studies on canine rabies vaccines, S. R. DAMON (*North Amer. Vet.*, 23 (1942), No. 3, pp. 186-192).

The dog Strongyloides, with special reference to occurrence and diagnosis of infections with the parasite, J. T. LUCKER. (U. S. D. A.). (*Vet. Med.*, 37 (1942), No. 3, pp. 128-137, figs. 3).

Methods of obtaining blood of fowl for complete blood examination, C. J. HAMRE and J. T. MCHENRY. (Hawaii Expt. Sta.). (*Poultry Sci.*, 21 (1942), No. 1, pp. 30-34).—Studies have shown that the direct capillary hematocrit method of cell volume determination yields satisfactory results if several blood samples are taken and centrifuged and those showing satisfactory packing are selected and averaged. Approximately 2-cc. samples of blood withdrawn into 5-cc. syringes, which have been dried after receiving 0.05-cc. stock heparin solution, yield consistently accurate results for the volume of packed red blood cells. The stock heparin solution should contain 0.75 cc. of "Liquaemin" per 5 cc. of distilled water. Subsamples of heparinized blood allowed to stand for an hour or more give accurate cell volume values, but they are satisfactory for the enumeration of red cells, leucocytes, and thrombocytes only if subsampling is performed immediately on securing the original sample.

The effect of mineral supplements on the availability of manganese, P. J. SCHAIBLE and S. L. BANDEMER. (Mich. Expt. Sta.). (*Poultry Sci.*, 21 (1942), No. 1, pp. 8-14, figs. 3).—Reference is first made to the known fact that poultry develop perosis if the ration is deficient in manganese or contains an excess of mineral supplements such as bonemeal or oystershell, and that the concentration of insoluble calcium and phosphorus is considerably greater in the intestinal contents when chicks are fed high-mineral rations. An investigation conducted with the view to determining whether such insoluble material reduces the solubility of manganese and in this manner decreases its availability to the chicks is reported. The experimental work has shown that an excess of bonemeal or chemically pure $\text{Ca}_3(\text{PO}_4)_2$, removed manganese from solution through absorption by the insoluble portion of these supplements in the presence or absence of feed ingredients. Oystershell adsorbed manganese less efficiently than the phosphate and was ineffective in the presence of feed. Feeding tests corroborated

these results, in that perosis developed with an excess of these supplements in the ration and, to a greater extent, with phosphates. It is deduced, therefore, that manganese is made unavailable to the chick because such supplements remove manganese from the liquid phase of the intestinal contents. The adsorptive nature of these minerals causes rations containing an excess of calcium and phosphorus to behave like manganese-deficient rations in producing perosis. The manganese of the ration soluble in 0.1 N HCl was related to the incidence of perosis when consideration was given to the amount of calcium and phosphorus present and may be used as an indication of the perotic potentialities of practical poultry rations. With rations normal in regard to calcium and phosphorus, 3 p. p. m. of acid-soluble manganese sufficed to prevent perosis almost entirely; when calcium and phosphorus were in excess, the acid-soluble manganese had to be greater. The solubility of manganese supplements in acid alone cannot be used as a criterion of their availability because some, such as the oxides, were more soluble in acid when the ration was present.

Respiratory diseases of poultry, C. D. LEE (Iowa State Col.). (*North Amer. Vet.*, 23 (1942), No. 2, pp. 98-103).—A practical account.

Notes on a specific infectious respiratory disease affecting baby chicks (infectious bronchitis), A. KOMOROV and Y. S. GRASOVSKY (*Vet. Jour.*, 97 (1941), No. 12, pp. 407-410).—A respiratory disease of baby chicks, first observed in the western valley of Esdraelon, Palestine, during the hatching season 1939-40, is described. It is said to resemble closely that observed by Schalk and Hawn (*E. S. R.*, 65, p. 271) and later by Beach and Schalm (*E. S. R.*, 76, p. 106).

Prevention of colds and roup in poultry easier than cure; sanitation recommended, H. D. POLK (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 3, p. 5).—A general article on avoiding roup and colds in poultry by improved sanitation and hygiene and isolation of healthy and diseased birds.

Flowers of sulphur and charcoal in the prevention of experimentally produced coccidiosis, O. E. GOFF (Ia. Expt. Sta.). (*Poultry Sci.*, 21 (1942), No. 1, pp. 23-29).—The data presented in this further contribution (*E. S. R.*, 84, p. 106) support the earlier finding that in preventing coccidiosis the value of a ration containing 5 percent flowers of sulfur is increased when supplemented with 5 percent oakwood charcoal. A ration containing 2 percent flowers of sulfur plus 5 percent oakwood charcoal was essentially equal to a ration containing 5 percent flowers of sulfur. An initial infection with *Eimeria tenella* increased refractiveness (immunity) to a subsequent inoculation. When measured in terms of mortality, however, the disease was not prevented. Up to 5 percent flowers of sulfur was fed to chicks 4 weeks of age or older for a 2-week period without deleterious effects. Inclusion of charcoal in a basal ration in the absence of flowers of sulfur was of no benefit in coccidiosis prevention. It was indicated that chicks 12 weeks of age had greater resistance to coccidiosis than had chicks that were 18 or 28 days old.

Gizzard lesions in day-old chicks, I-III, A. E. TEPPER and H. R. BIRD (Md. Expt. Sta.). (*Poultry Sci.*, 21 (1942), Nos. 1, pp. 47-57, figs. 2; 2, pp. 108-110, fig. 1).—This contribution is presented in three parts.

I. Their relationship to subsequent growth and mortality and their prevalence (pp. 47-51).—The investigation conducted, the details of which are presented in tables, shows that under a good feed and management program there is no significant relationship between incidence of gizzard lesions in chicks as day-olds and subsequent growth, livability, and efficiency of feed utilization of these chicks to 12 weeks of age. Furthermore, under such a system of feeding and management, growth, livability, and efficiency of feed utilization are normal. There are considerable differences in the severity of

chick gizzard lesions among hatcheries, but in no case was any hatchery found to produce chicks free from this disease. The disease is widespread throughout the country, as evidenced by a survey of 87 lots of chicks from different regions of the United States involving 1,737 day-old chicks which showed 74 percent affected. The locality of origin of the chicks examined does not appear to be closely related to gizzard score. Lesions similar to those observed in the gizzards of chicks have been found present in gizzards of artificially propagated pheasants and quail.

II. *The time of origin and factors influencing the cause of gizzard lesions in chicks* (pp. 52-57).—It is found that gizzard lesions make their initial appearance on the twentieth day of incubation as minute or large hemorrhages immediately under the lining of the gizzard. There appears to be no relation between the size or weight of gall bladders in day-old chicks and the severity of gizzard lesion observed. Increasing the blood pressure of 16-day-old embryos through injections of adrenalin will cause the formation of hemorrhages in the gizzard capillaries on the eighteenth day and result in lesions similar to those observed "normally" on the twentieth day. There is a direct relationship between size of yolk taken into the body cavity of the developing chick and severity of gizzard lesions in day-old chicks. The initiation of pulmonary respiration, the cessation of extra-embryonic circulation, and the inclusion of the yolk sac and its contents into the body cavity of the developing chick appear to be cumulative in their effect upon the severity and occurrence of gizzard lesions in day-old chicks.

III. *Can severity of incidence be reduced by dietary control?* (pp. 108-110).—The severity of the gizzard lesions of newly hatched chicks was related to the diet fed to the dams. In each of two tests, two groups of hens fed on rations of oats, wheat products, alfalfa meal, and meat and fish scraps, with free access to a grass range, did not develop as severe gizzard erosion symptoms in the day-old chicks as were produced in chicks hatched from groups of confined hens on a ration of yellow corn products and dried skim milk, minerals, and cod-liver oil. When the rations were reversed between the ninth and tenth weeks in the second experiment, there was a reversal in the relative amounts of gizzard erosion in the chicks of the two lots. It was not possible to determine whether the severity of the gizzard erosion symptoms was due to one of the feedstuffs or a combination of several.

The feeding of corn cockle to chickens, G. F. HEUSER and A. E. SCHUMACHER (Cornell Univ.). (*Poultry Sci.*, 21 (1942), No. 1, pp. 86-93, figs. 3).—Corn cockle, the seed of which is usually found in wheat in a percentage ranging from practically none to about 2, is recognized to contain a toxic substance known as githagin, a saponinlike glucoside listed as a hemolytic poison. The poisonous principle said to be present in all parts of the plant but mainly in the seed, is destroyed by heating to 50° C. Animals seem to become accustomed to the poison so that the amount of seed first causing sickness later has no injurious effect. In the feeding experiments conducted affected birds presented a generally listless and unkempt appearance with rough feathering and diarrhea. Characteristic lesions of cheesy material in the mouth and under the tongue were present. In the feeding of ground cockle to chicks no effect was observed on the average weight at 6 weeks of age until more than 2 percent of ground cockle was added to the feed. Lesions in the mouth, however, were present even when 0.25 percent was fed. Two percent of the feed, which resulted in the consumption of an amount equal to 0.3 percent of the body weight, appeared to be toxic; 4 percent of the feed or 0.5 percent of the body weight caused mortality. In the feeding of ground cockle to older

birds (6 to 10 weeks of age) 5 percent in the ration or 0.3 percent of the body weight was toxic in that weight was affected. However, a tolerance to the poison was developed so that later 0.4 to 0.5 percent of the body weight could be consumed without affecting growth. Ten percent of the ration or 0.8 percent of the body weight was lethal to some of the birds. Cockle poisoning decreased the respiratory rate and heart rate of the birds. Body temperature and red blood cell count were not affected.

The feeding of unground cockle in the case of both young and older chicks had no apparent effect upon the birds even though the intake of cockle was as large as that of birds which were definitely affected by the ground cockle. The consumption of whole cockle amounted to 3.5 percent of the food intake in the case of the younger chicks and 5.9 percent in the case of older birds.

Paratyphoid in baby wood ducks, N. D. LEVINE and R. GRAHAM. (Univ. Ill.). (*Jour. Amer. Vet. Med. Assoc.*, 100 (1942), No. 780, pp. 240-241).—Report is made of an outbreak of paratyphoid associated with *Salmonella typhimurium* which caused the death of 400 of 500 week-old wood ducks (*Aix sponsa*). The organism was isolated from a healthy adult mallard on the premises, and it is possible that the infection may have followed premise contamination by adult carriers.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the Iowa Station] (*Iowa Sta. Rpt. 1941, pts. 1, pp. 52-58, figs. 4; 2, pp. 22-24, 24-26*).—This report contains, in part 1, brief notes on an investigation of farm building losses due to wind and fire, plywood, steel, and lumber in farm building construction, atmospheric exposure tests of wire and fencing, and farm fence construction, all by H. Glese; utilization of agricultural wastes for farm building insulation, by H. J. Barre; and labor, power, and equipment requirements of various methods of harvesting, transporting, processing, and storing hay, and of storage, treatment, transportation, and distribution of dairy barn manure, both by J. B. Davidson and E. G. McKibben.

In part 2, under the general caption methods and equipment for seedbed preparation, planting, cultivating, and harvesting [of corn], efficiency of corn pickers, seedbed preparation for corn, and corn production methods and equipment are noted by C. K. Shedd, Davidson, and E. V. Collins. Under the caption methods, equipment, and buildings for curing and storage of corn, the storage and curing of corn is reported upon by H. J. Barre, Davidson, and J. L. Robinson; and investigation of farm storage of corn, by Davidson and G. Semenluk.

Some engineering implications of high-speed farming (*Agr. Engin.*, 22 (1941), No. 5, pp. 165-169, figs. 8).—This is a symposium consisting of contributions by C. J. Scranton, E. McCormick, B. G. Burr, and D. C. Heltshu.

Measuring water in irrigation channels, R. L. PARSHALL. (Coop. Colo. Expt. Sta.). (*U. S. Dept. Agr., Farmers' Bul. 1683, rev. (1941), pp. [2]+30, figs. 16*).—This revision (*E. S. R.*, 66, p. 672) describes the Parshall measuring flume, the various common weirs, and their adaptability to the measurement of irrigation deliveries to farms.

Hydraulic head measurements in soils with high water tables, R. E. MOORE and K. R. GOODWIN. (*U. S. D. A.*). (*Agr. Engin.*, 22 (1941), No. 7, pp. 263-264, figs. 6).—Portable apparatus consisting of a soil probe, a mechanism to force the probe into the earth, and a device to measure the hydraulic head at the probe point is described. Information on the hydrology and stratigraphy

of unconsolidated soil sediments below the water table may be derived with this apparatus. Applications of this information to engineering investigations are discussed.

A flood control and water conservation project, W. L. POWERS. (Oreg. Expt. Sta.). (*Agr. Engin.*, 22 (1941), No. 7, pp. 262, 265, fig. 1).—The primary object of the Willamette Basin project in Oregon is protection against floods and to conserve the excess water for an aid to development of navigation, power, irrigation, and reduction of stream-bank erosion and stream pollution. Major construction features include seven storage reservoirs, locks, open-river improvement, and fish facilities, at a total estimated cost of \$62,070,000. The seven proposed reservoirs would have a total capacity of 1,345,000 acre-ft. and a total surface area of 26,800 acres. A further plan calls for raising three dams for power development. It is planned that the reservoirs would be emptied in the late autumn and caused to fill only partly, as necessary to equalize run-off. Storages would be filled in early spring and release made from about July 1 in the interest of navigation and irrigation. Annual cost of operation is estimated to approximate benefits and is to be borne by the Federal Government. Agricultural benefits from the project are here considered briefly.

Report of the Administrator of the Rural Electrification Administration, 1941, H. SLATTERY (*U. S. Dept. Agr., Rural Electrification Admin. Rpt.*, 1941, pp. III+26).—On December 31, 1934, about 4 mo. before the Administration was established, 10.9 percent of American farms had central-station electric service. At the end of the fiscal year 1941 this figure had risen to 34.9 percent.

This report details the normal operations of the fiscal year 1941, briefly notes the place of the Administration in the national defense program, takes up legal aspects of rural electrification, and summarizes the current fiscal status of R. E. A. borrowers. An appendix tabulates data concerning progress of current activities.

A progress report on the investigation of the various uses of electricity on the farms of Washington for the year 1941 (*Wash. Com. Relat. Elect. Agr., Ann. Rpt.*, 17 (1941), pp. [7]+70, pls. [5], figs. [21]).—This report deals with current results of various investigations as follows: Electric Light for Egg Production, by J. Roberts and J. S. Carver (pp. 1-14) (*Wash. Expt. Sta.*) (*E. S. R.*, 87, p. 103); Poultry Air-Conditioning, by J. S. Kincaid and J. Roberts (pp. 15-31); A Comparison of the Wet and Dry Cooling of Dressed Poultry, by J. Roberts and E. I. Robertson (pp. 32-34) (*Wash. Sta.*); Water Warming for Poultry, by J. S. Carver and J. Roberts (p. 35); Evaporative Egg Room Cooler and Humidifier, by W. A. Luce and J. Roberts (pp. 36-39); The Fundamental Requirements of Poultry Brooding, by J. Roberts and J. S. Carver (p. 40); Studies of the RS-4 Lamp, by J. S. Carver, Rhian, and J. Roberts (pp. 41-44); The All-Electric Greenhouse (pp. 45-48) and Electric Light for Carnations (p. 49), both by J. Roberts and [S. E.] Wadsworth; Farm Refrigeration (pp. 50-53); Germicidal Lights for Meat Storage, by Ensminger, [J. A.] McIntosh, [C. C.] Prouty, J. Roberts, and [J.] Sotola (pp. 54-60); Livestock Tank Heaters (p. 61); Electric Pig and Lamb Brooders (p. 62); Milk Houses, by [H. A.] Bendixen, J. Roberts, and [L. J.] Smith (p. 63); Milk Cooling Survey, by [H. A.] Bendixen and J. Roberts (pp. 64-67) (see p. 279); and Poultry House Blackout [A]ffects Poultry Lighting Schedules, by J. S. Carver (pp. 68-70).

What farm electrification needs, B. D. MOSES. (*Calif. Expt. Sta.*). (*Agr. Engin.*, 22 (1941), No. 5, pp. 179-180, 184, fig. 1).—Taking into consideration the points of view of both producer and consumer, "probably the greatest needs at the present time are to increase the consumption of those already having

service, to increase the number of customers on existing lines, and to establish service in the marginal and remote areas." Measures suggested and discussed include educational efforts with the purposes (1) of increasing the efficiency of use of equipment on hand and knowledge of additional operations which could be electrically powered and (2) of inducing manufacturers to give accurate information in advertisements concerning the power consumption, labor requirements, and productive capacity to be expected from machines offered.

Irrigation pumping with electric power, A. MOLENAAR. (U. S. D. A.) (*Agr. Engin.*, 22 (1941), No. 7, pp. 257-258, 260, figs. 8.)—The author points out the necessarily rather high cost of distribution of electric power to pumps usually placed at considerable distances apart and operated seasonally, noting further that this cost must be met by a retail rate higher than that charged for more profitable types of load. Equipment capable of efficient performance, therefore, is a prime requisite to the lasting success of an irrigation load. Failure of attempts to attach electric motors to pumps efficient enough to have been thought satisfactory under internal-combustion-engine operation is shown in a number of illustrative instances. A financing plan providing 6-yr. loans at reasonable interest rates has proved effective in enabling farmers to put in equipment permitting economically sound operation. A greatly increased number of correctly chosen irrigation pumps has been added to the load of the county public power district as a result.

New developments in small electric milk pasteurizers, D. E. BLANDY and M. W. NIXON (*Agr. Engin.*, 22 (1941), No. 7, pp. 253-256, figs. 6).—Difficulties which formerly rendered pasteurizing of milk in the bottle bacteriologically ineffective and undesirable because of its physical effect upon the product have been overcome through (1) the use of a new special squat-type, oversize, lightweight (16.5-oz.) milk bottle, (2) the use of welded steel-wire milk bottle crates, and (3) even circulation of a deluge of regulated hot water around the bottles. The new equipment consists of a hot-water tank with water pump, immersion-type electric heaters and the necessary thermostats to control the temperature of the water bath, an indicating and a recording thermometer, and racks to support the bottle cases. It was necessary to use the new thin-wall, oversize glass milk bottle. Convection currents are set up in this bottle, making heating about twice as rapid as in the standard bottle. Bottle caps with paper inserts seal the bottle.

The authors also describe in some detail a high-temperature, short-time, continuous-process pasteurizer. This apparatus was designed on the principle that if manual adjustments could be eliminated, all adjustable devices, including temperature regulators, means of regulating the rate of water flow, and the milk flow could be adjusted, tested, and sealed by the department of health, and these adjustments checked periodically by inspectors.

Milk cooling survey, [H. A.] BENDIXEN and [J.] ROBERTS. [Wash. Expt. Sta.]. (*Wash. Com. Relat. Elect. Agr., Ann. Rpt.*, 17 (1941), pp. 64-67).—A survey of milk cooling practices covering 186 farms in important milksheds of the State of Washington revealed that electricity was available on 94.6 percent of them and that 64.5 percent used water for cooling, 4.8 percent ice, 29.5 percent dry mechanical coolers, and 3.2 percent wet mechanical coolers. With a mean water temperature of 54° F., it appeared that those producers using water for cooling could not meet the State requirement that milk must be cooled to 55° within 30 min. after milking and must not exceed 60° until delivered.

How farm machinery has benefited southern agriculture, R. M. MERRILL. (U. S. D. A.). (*Agr. Engin.*, 22 (1941), No. 7, pp. 247-248).—Southern agricul-

ture has benefited less from larger and more efficient power units and farm equipment than the country as a whole. Probably the two most influential retarding factors have been the topography of farm land and the type of agriculture. Among gains specifically mentioned is that of the encouragement of soil conservation. It is also noted, in an illustrative example, that there has been little labor displacement, former sharecroppers being now employed as wage laborers.

The Nebraska tractor tests, 1920-1941 (*Nebraska Sta. Bul. 338 (1942)*, pp. 52+[1]).—This bulletin extends the record for previous years (E. S. R., 85, p. 260) to include the results of the 1941 tests.

Encouragement of cereal grain production by means of the combine harvester and the hammer mill (*Maine Sta. Bul. 405 (1941)*, pp. 455-456).—It is suggested by W. F. Dove that primary obstacles in the way of increased cereal grain production in northern New England—namely, rain and wet weather at harvest time and wet weather delaying the harvest of cereals to a time when the potato harvest starts—may be overcome by means of the combine harvester. Using such a machine at the station's Aroostook farm, two men are able to bring in a harvest of bagged grain from the field without the weather hazard and time-loss and interference associated with shocking, stacking, and threshing when each operation is separate. Locally distributed hammer mills would also encourage cereal grain production.

Flaxseed production problems in the Southwest, E. S. McFADDEN. (U. S. D. A.). (*Agr. Engin.*, 22 (1941), No. 7, p. 265).—In the old flaxseed-producing regions, flax is usually harvested with the same machinery that is used for harvesting other small grains. In the greater part of the flaxseed-producing area of the Texas coastal prairie where small grains are not grown, the wind-row pick-up method is rapidly becoming the standard method of harvesting. Small combines used in harvesting grain sorghums do fairly well after minor adjustments have been made. However, the tooth type of cylinder which is in general use in threshing flax in the spring wheat area is not entirely satisfactory in south Texas due to the high relative humidity, which toughens the seed bolls or pods and results in a tendency of the cylinder teeth to strip the bolls off without crushing them and releasing the seed. The rasp-bar type of cylinder is somewhat more effective than the tooth type, but it also leaves many of the bolls unbroken. A recent invention partly solves this problem by an attachment consisting of a set of rubber rollers or of one rubber and one steel roller. The crop passes through these rollers just before it reaches the cylinder, and the greater part of the bolls are crushed upon passing between the rollers. Possibly the only additional equipment required to perfect the pick-up threshing of flax under ordinary south Texas conditions is a second set of smaller rollers to crush the unbroken bolls that find their way into the tailings. This second rolling could be done either before the tailings enter the return elevator or just before the tailings re-enter the cylinder. An important accessory is a seed recleaner mounted on the thresher.

Recent developments in sugar cane planting and ratooning equipment, W. J. MAZE (*Hawaii. Sugar Technol. Rpts.*, 4 (1941), pp. 37-42, figs. 12).—The author briefly summarizes planter development in Hawaii, beginning with a sled planter built about 22 yr. ago, one of the first successful machines and the first to furrow and drop the seed in one operation. The first wheel-mounted planter followed 2 yr. later. This machine had also a roller-covering device and a fertilizer distributor. Further developments are followed, including those of present-day machines.

The history of ratooning equipment is similarly outlined. Use of ratooning equipment was formerly confined mostly to unirrigated areas, about the only equipment used in irrigated fields being 8-in. walking plows and middle breakers for hilling up cane. A reversible shovel plow appeared about 1924, was widely used for a time, and was followed about 1930 by a line reshaper which has had a wide influence on ratoon operations on all irrigated, and most unirrigated, plantations. In 1927 a directly connected tool frame made possible the use of tractors for the various operations connected with mechanical ratooning. Ratooning machinery and practice, like the planting equipment, are followed through to the current devices and methods.

The Graver Continuous Clarifier at Ewa Plantation Company, F. E. GAY (*Hawaii. Sugar Technol. Rpts.*, 4 (1941), pp. 57-67, figs. 4).—This clarifier operates upon basic principles entirely different from those of the standard lime-defecation processes heretofore practiced in Hawaii, namely, extremely low juice velocities throughout which prevent any redispersion of the formed floc and "upward sludge filtration" which allows the incoming juice to flow upward through a blanket of settlings that acts as a filtering medium by retaining fine nonsettling particles. The operating characteristics of the clarifier are analyzed, and the nature of the device and its mode of operation are indicated in a diagrammatic drawing and in illustrative velocity of flow calculations, etc. A rate of handling of juice which would have been impossible with the intermittent-type settling tanks formerly used was attained. Other improvements in processing are noted. The finished sugars compared favorably with the best sugars produced in the Hawaiian Islands.

Blowers for frost protection, C. I. GUNNESS. (Mass. State Col.). (*Agr. Engin.*, 22 (1941), No. 7, p. 252).—An experimental set-up at the Massachusetts Cranberry Substation consists of an 8-cylinder automobile engine driving a 6.5-ft. propeller. The machine was placed at the edge of a 12-acre bog about 8 ft. above the bog, but is mounted on a turntable and was built to be put eventually in the center of a bog and turned in a circle. With a temperature inversion of 5° the author was able to raise the temperature on the bog from 4° to 5° to a distance of 300 ft., indicating that the machine will give considerable protection to a 6-acre bog. The magnitude of the temperature inversion which can be expected at times of frost remains to be determined, but the use of blowers appears to hold considerable promise for cranberry growers.

Rating and care of domestic sawdust burners, E. C. WILLEY (*Oreg. Engin. Expt. Sta. Bul.* 15 (1941), pp. [2]+27, figs. 9).—The tests and investigations here recorded showed that the most important characteristics of the burners were (1) area of the grate, (2) stack-draft pressure, and (3) the amount of opening available for the air supply. Domestic sawdust burners should be rated for capacity according to the size (projected square feet area) of their grates, and, for all general purposes, upon the assumption of an output of 150,000 B. t. u. per hour per square foot of grate surface. The intensity of stack-draft pressure is very important. A minimum of 0.1 in. of water stack draft should be available at the smoke connection of the furnace. In cases of higher draft intensities, a regulator in the smoke connection should be provided. The highest output rating nearly always was obtained when the draft was about 0.1 in. Even at the largest draft opening the output was maximum at 0.1-in. draft pressure and decreased at higher draft pressure. The highest efficiency was also obtained when the draft pressure was about 0.1 in.

Oversized burners were found to cause much inconvenience in that the fixed auxiliary intake necessary to maintain combustion will give excessive heating even when the main draft has been shut. If the auxiliary air supply is reduced to prevent the overheating, unburned gas in the combustion chamber, backfiring, and creosote condensation due to letting the smoke connection cool too much may result. The domestic sizes of sawdust burners were found well adapted to automatic control. Thermostatic controls on the draft doors of the burners may save as much as 25 percent of the fuel, and a much more even temperature may be obtained. Correction of burner troubles, such as backfiring and smoking, burning back into the fuel hopper, creosoting, poor feeding and arching of the fuel in the hopper, etc., were also studied, and remedies for these difficulties are taken up in some detail.

Shrinkage of artificially dried seed corn, R. H. WILEMAN. (Purdue Univ.). (*Agr. Engin.*, 22 (1941), No. 7, p. 256, figs. 2).—The volume shrinkage was determined by measuring the depth of the corn in the bin at the time drying began and again when it was finished. The average weight and volume shrinkage which resulted from the removal of various percentages of moisture from seed corn under the above conditions is shown in a graph. These data were secured during the 1937, 1938, 1939, and 1940 drying seasons on 44 bins of double-cross hybrid seed corn. Ten Indiana hybrids are represented in the tests. The graph shows a linear relationship between percentage of moisture removed from the grain and both volume shrinkage and weight shrinkage. The two relationships show very similar slopes, the weight shrinkage rate being slightly the greater.

Use of CO₂ in the control of hay mow fires, L. G. KEENEY (*Agr. Engin.*, 22 (1941), No. 5, p. 176).—Carbon dioxide driven down through three 1-in. pipes inserted into the heated area in a mow of chopped hay showing signs of incipient ignition kept the temperature well below the danger point in the immediate vicinity of the pipes, although removal of the hay (after arrival of fire-fighting equipment made such removal safe to attempt) revealed the presence of coals sufficient to start a small blaze at several points. The equipment consisted of several 20-lb. drums of carbon dioxide, a pressure regulating valve, and 50 ft. of 5/8-in. hose.

Farm building service for the Southwest, D. G. CARTER. (Ark. Expt. Sta.). (*Agr. Engin.*, 22 (1941), No. 7, pp. 266-267).—A four-point program in farm buildings suggested for consideration consists of (1) emphasis on the need for more farm building specialists and more technical training in housing and building for agricultural workers; (2) continued efforts toward farm building improvement, with available facilities, by stressing plans, home labor, native materials, and technical aid where possible; (3) endorsement of a bill now before the U. S. Senate for research and extension work in farm buildings; and (4) efforts to develop a plan service handbook for the Southwestern States.

Poultry house air cooling, J. ROBERTS and J. S. CARVER. (Wash. Expt. Sta.). (*Wash. Com. Relat. Elect. Agr., Ann. Rpt.*, 17 (1941), pp. 23-31, figs. 7).—Air cooling by mechanical methods involving 20 air changes per hour provided a 15°-20° F. differential between outside and inside during the warmest part of the summer day. Mortality due to hot weather was eliminated, and egg production was slightly increased.

The installation and use of attic fans, W. H. BADGETT (*Tex. Engin. Expt. Sta. Bul.* 52 (1940), pp. [2]+45, figs. 44).—Selection and mounting of an adequate fan, construction of ceiling grilles, suction boxes, louvers, hooded and

louvered penthouses, automatic shutters, etc., are presented in detail with working drawings, diagrams, photographs, and the performance curves of a 42-in. fan.

AGRICULTURAL ECONOMICS

Important sources of information for work in agricultural economics (*California Sta.*, 1941, pp. [3]+50).—This is a source handbook for agricultural economists, compiled by the Glannini Foundation of Agricultural Economics.

Statistical methods applied to agricultural economics, F. A. PEARSON and K. R. BENNETT (*New York: John Wiley & Sons; London: Chapman & Hall*, 1942, pp. VII+443, figs. [56]).—A book explaining the methods and application of statistical methods, especially to problems in agricultural economics and the social sciences in general. The book takes up tabular analysis of relations and applications of variance to these problems.

The relationship of the method of graphic correlation to least squares, R. J. FOOTE and J. R. IVES (*U. S. Dept. Agr., Statis. and Agr. No. 1* (1941), pp. [2]+33, figs. 4).—It is the purpose of this paper to examine the meaning of the various steps involved in the graphic correlation procedure from the point of view of the least squares method.

[Investigations in agricultural economics by the Delaware Station] (*Delaware Sta. Bul.* 235 (1941), pp. 5-10).—Included, in addition to findings previously noted, are (1) tables with discussions based on a study of farm mortgages in Kent County by M. M. Daugherty showing the changes in sources of loan funds from 1912-14 to 1936-38, the duration of the original contracts, and the relationships between date of mortgage and losses of principal and between the time of foreclosure and sufficiency of sale prices; and (2) data as to land areas in different land classes and the relationship between various farm factors and land classes obtained by R. O. Bausman and J. E. H. Lafferty in a land classification study in Sussex County.

[Investigations in agricultural economics by the Iowa Station, 1941] (*Iowa Sta. Rpt.* 1941, pts. 1, pp. 209-229, 239, figs. 2; 2, pp. 26-27, 69).—Part 1 includes reports on the following subjects: The use of simple farm records in farm management, by J. A. Hopkins; Iowa farm price trends, by T. W. Schultz; farm tenure and leasing practices, by R. Schickele; movement of farm populations, by Schultz; factors affecting the grade of Iowa hogs, by G. S. Shepherd, M. D. Helser, and F. J. Beard; substitution of various hay and pasture crops for small grain crops for feeding pigs, by L. G. Allbaugh; specific agricultural cycles and the interrelationship of agricultural prices, by G. Tintner; formulation and operation of soil conservation programs for individual farms, by A. C. Bunce; analysis of farm mortgages and land transfers in selected Iowa counties, by W. G. Murray; development of improved methods of farm land and building valuation, by Murray, R. W. Simonson, H. R. Meldrum, A. J. Englehorn, and H. Glese; effectiveness of livestock cooperatives, by S. H. Thompson; price and production policies of the meat packing industry, by W. H. Nicholls; analysis of farm records, by Allbaugh, W. W. Wilcox, and Hopkins; cost data on commercial cattle feeding, by Hopkins, P. S. Shearer, and C. C. Culbertson; marketing of lambs, by Shepherd; cut-out profit or loss on hogs, by I. W. Arthur; low-income farm organization and management, by Hawkins, Wilcox, Englehorn, and R. E. Wakeley; effects of governmental programs on Iowa's agricultural resources, by Wilcox; corn and hog prices and expectations, by Schultz; production and storage of lard and lard substitutes, by A. Kozlik and Schultz; cream route organization and operation, by F. Robotka, J. M. Cowden, and P. E. Quintus; defense financing and its

economic effects upon agriculture, by Schultz, Wilcox, and M. G. Reid; and farm tenancy, by C. F. Curtiss.

In part 2 there are studies on methods and equipment for harvesting, processing, and storing corn silage, by Davidson, E. V. Collins, and C. K. Shedd; and grain merchandising practices, by Robotka and R. C. Bentley.

[Economic studies in Mississippi], M. GUIN (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 3, pp. 1, 8).—Brief notes are given entitled Cash Income of Farmers Higher in '41 (p. 1) and Livestock on Mississippi Farms, January 1, 1942 (p. 8).

[Economic studies in North Dakota], W. L. ETTESVOLD (*North Dakota Sta. Bimo. Bul.*, 4 (1942), No. 4, pp. 11-12, 22-23).—These articles include Livestock Numbers and Values in North Dakota Increasing (pp. 11-12) and North Dakota Farm Prices (pp. 22-23).

[Economic studies in Ohio] (*Ohio Sta. Bimo. Bul.* 214 (1942), pp. 53-56).—In an article entitled Types of Outlets Used by Ohio Farmers in Marketing and Purchasing Their Livestock, by G. F. Henning (pp. 53-55), the conclusion is drawn that Ohio farmers, when ready to market their livestock, depend principally upon auctions, concentration yards, and livestock dealers. Even though the motor-truck makes it easy for stockmen to consign their livestock to selling agencies on the terminal markets, this study showed that less than 20 percent of the slaughter livestock was marketed to terminal markets.

The customary index numbers of production, prices, and income are presented by J. I. Falconer (p. 56).

[Investigations in agricultural economics by the Puerto Rico University Station] (*Puerto Rico Univ. Sta. Rpt.* 1941, pp. 1, 2, 9, 22-36).—Brief general findings are included as to (1) costs and profits in growing tomatoes, by L. M. Géigel, R. Colón Torres, and M. Hernández; (2) costs, labor requirements, and profits in growing cotton, by Géigel and Hernández; (3) cost of oxen work on small farms and the profitableness of the dairy cattle enterprise in the northwestern coast region and in the tobacco region, by F. de Jesús; (4) production, prices, purchasing power, consumption, etc., of tobacco, by J. J. Serrallés, Jr., and M. Vélez, Jr.; (5) farm income on small Puerto Rico Reconstruction Administration farms, by D. Haddock; (6) need of credit by tobacco growers, variations in production credit terms, etc., by S. L. Descartes and J. O. Morales; (7) retailers' gross margins on fruits and vegetables, by S. Díaz Pacheco and J. R. Noguera; (8) vegetable marketing cooperatives, by J. Maisonet; (9) deficiencies in milk and egg consumption, deficiency in quantity of diet, etc., in Puerto Rico, by Descartes, Díaz Pacheco, and Noguera; (10) use of crop- and pasture land on small farms, by R. Colón Torres; (11) need of improvement of the "parcelero" system of making lands of the U. S. D. A. Forest Service available to laborers, by Descartes, H. Zayas Chardón, and Colón Torres; and (12) the profitableness of coffee farming, 1934-38, by E. del Toro, Jr., and Haddock.

Foreign Agriculture, [February-April 1942] (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr.*, 6 (1942), Nos. 2, pp. [2]+43-82, figs. 11; 3, pp. [2]+83-120, figs. 3; 4, pp. [2]+121-164, figs. 9).—No. 2 includes an article on Cuban Agriculture, by P. G. Minneman (pp. 43-76), in which the people, the natural resources, organization of agriculture, crop and livestock production, foreign trade, and agricultural policy and development are discussed; and an article on Food Consumption in German Worker Families, by J. H. Richter (pp. 77-82) noted on page 307.

No. 3 includes an article on French Equatorial Africa, by P. K. Roest (pp. 83-108), discussing the physical features, the people, land utilization and land policy, industry, trade, and transportation, and Government policies and assistance; and

an article on War Places New Burden on Eastern Russian Agriculture, by L. Volin (pp. 109-120), discussing the general characteristics of the area, farm organization, crops and livestock, and the outlook during the war period.

No. 4 contains an article on The Agriculture of Jamaica, by K. H. Wylie (pp. 121-146); and one on the Food Situation in Far Eastern and Southeastern Asia, by W. Ladejinsky and F. J. Rossiter (pp. 147-164).

Some selected references relating to the impact of the war upon the national agricultural program (*U. S. Dept. Agr., Bur. Agr. Econ., 1941, pp. 43*).—Extracts are presented of addresses given by the following officials of the Department of Agriculture: C. R. Wickard, Secretary of Agriculture, on Agricultural Preparedness, at Lafayette, Ind., January 15, 1941 (pp. 3-7), and on the Weak and Strong Features of Our Farm Policies, at Des Moines, Iowa, February 22, 1941 (pp. 34-43); C. C. Davis, Agriculture Commissioner of the National Defense Advisory Commission, on The Relation of Agriculture to the National Defense Program, at St. Louis, Mo., January 31, 1941 (pp. 8-13); R. M. Evans, Administrator of the Agricultural Adjustment Administration, on Financing Farm Programs, at Baltimore, Md., December 9, 1940 (pp. 13-22), and on Problems Ahead for American Farmers, at Des Moines, Iowa, January 29, 1941 (pp. 22-24); D. F. Christy, Assistant Director of the Office of Foreign Agricultural Relations, at Lafayette, Ind., January 15, 1941 (pp. 24-29); and E. W. Gaumnitz, Assistant Administrator of the Surplus Marketing Administration, at Ithaca, N. Y., February 12, 1941 (pp. 29-34).

War and agriculture in the United States, 1914-1941, W. T. BORG (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 93 (1942), pp. 11 + 43*).—This is a selected list of 230 references on the effects of World War I and the present crisis on agriculture. "It consists of references to specific studies, articles in learned publications devoted to agriculture, Government reports, and addresses and articles by policy makers of the United States Department of Agriculture."

Agricultural planning in a world at war.—A progress report covering the cooperative agricultural planning program for the year ending June 30, 1941 (*U. S. Dept. Agr., 1942, pp. [4] + 38, pls. 2, figs. 6*).—This is a condensed summary of the annual agricultural progress reports prepared and submitted by the Land-Grant College and Bureau of Agricultural Economics committees in each of the States engaged in agricultural planning activities.

Land-use adjustment in the Buffalo Creek grazing district, Yellowstone County, Montana, J. H. MARSHALL and S. W. VOELKER (*U. S. Dept. Agr., Bur. Agr. Econ., 1940, LE-6, pp. [2] + 59, pls. 8*).—First opened in 1880, the area was immediately stocked to capacity with Texas cattle. The early livestock industry depended upon competitive year-round grazing. A period of overgrazing and drought, culminating in the severe winter of 1886-87, resulted in the virtually complete loss of stock and the collapse of the livestock industry. During the period which followed, until about 1909, the livestock business was gradually re-established on a more secure basis. While this development very likely would have succeeded if permitted to continue, it was destroyed by homestead settlement, beginning about 1909 and reaching its peak about 1914. The land was settled in 160- and 320-acre tracts, almost completely overthrowing the range livestock industry. Crop farming, which never achieved any notable success in the area, encountered two prolonged drought periods in which crop failure was practically complete. The first extended from 1919 to 1923, and the second from 1928 to the current year.

Planning farm organization in Box Butte County, Nebraska, G. R. PETERSON and Q. H. BIERMAN. (Coop. Nebr. Expt. Sta.). (*U. S. Dept. Agr., Bur. Agr. Econ., 1940, F. M. 14, pp. [2] + 33, figs. 7*).—Successful farms are more prev-

alent in the larger size groups. More than two-fifths of the farms in the county are under 400 acres in size, but less than one-seventh of the successful farms appraised were in that group. Only one successful farm had less than 240 acres, yet one-fifth of all farms in the county had 240 acres or less. Land use varies widely from an intensive cropping system in the central part of the county to large-scale ranching at the borders. Operating units range in size from 4 acres to 22,360 acres, the variation corresponding generally to the variations in the soils and topography. A relatively high percentage of the land is operated under lease, particularly in some areas of broken topography and sandy soils.

Farm size as a guide to planning in the Tri-County Soil Conservation District, R. B. HILE (*U. S. Dept. Agr., Bur. Agr. Econ., 1940, F. M. 16, pp. [2]+30, figs. 8*).—Distress in areas similar to the Tri-County District of South Dakota is deemed certain to come unless farms are of a size to return an income in favorable years sufficient to provide reserves for less favorable years. In a general way, the district may be considered similar to much of the Great Plains so far as variations in size of farms and percentage of cultivation are concerned. Only one farmer operated less than 880 acres. The majority of farmers operated much larger units, and 40 percent were located on units ranging in size from 1,040 acres to 1,880 acres. A high percentage of these operators began farming in this area on units of roughly 240 acres. A rapid increase in average size came soon after settlement, and a gradual increase has occurred ever since.

Basic maps and materials available for land use planning in Tennessee, R. G. MILK. (Coop. U. S. D. A.). (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 109, rev. (1941), pp. [1]+IV+53, figs. 28*).—This is a list of source materials, maps, and other data for the use of land-use planners.

Research in interregional competition in agriculture, R. L. MICHELL (*U. S. Dept. Agr., Bur. Agr. Econ., 1941, F. M.-21, pp. [1]+32, figs. 10*).—Determination of the most desirable farm adjustments within a local area turns around forces which may be termed external and internal to the farm. Internal factors include the resources of the individual farm and the farmer's capabilities and limitations. External factors are in the main reflected in prices. Research in interregional competition is concerned with trends in production and consumption, with the underlying causes for the trends, and with their probable future direction. The final objective of such research is to contribute to the total agricultural adjustment process by making available the best possible information about the effects of factors "external" to the farm and the local planning area.

The topics discussed include the following: How to study regional trends, interregional competition in dairying, trends in dairying by major type-of-farming regions, the probable effects of the agricultural conservation program on livestock production in the Midwest dairy region, competition in dairying between the Great Lakes States and New England, interarea comparisons, applications to agricultural planning and department programs, public information aspects, and the national defense program.

Summaries from farm-business analysis studies in the United States, 1907-39, H. W. HAWTHORNE (*U. S. Dept. Agr., Bur. Agr. Econ., 1941, F. M.-26, pp. [2]+266*).—This is a synthesis of information concerning farm business studies in the United States, presented in tabular form.

[**Studies on farm management by the Nevada Station.**] (Coop. U. S. D. A.). (*Farm Managt. Buls. [Nev. Sta.], 1 (1940), Nos. 2, pp. [1]+7; 3, pp. [1]+9, fig. 1; 4, pp. [1]+5; 2 (1941), Nos. 1, pp. [1]+6; 2, pp. [5], figs. 2*).—Vol. I includes No. 2, Farm Business Summary of Sixty-Four Farms in Nevada for 1939, by M. L. Connor; No. 3, Summary of Family Classification, Farm Privilege, and Cash Cost of Living by Size of Income and Size of Family Groups,

by V. E. Scott and T. Wood; and No. 4, Five-Year Summary of Farm Accounts Kept on 29 Nevada Farms, by M. L. Connor.

Vol. 2 includes No. 1, Type of Farming in Nevada, 1940, by M. L. Connor and F. B. Headley; and No. 2, How Farm Income and Expenses Vary With the Price Index, by F. B. Headley and M. L. Connor.

A farm business study of the Six Mile area of Pickens County, South Carolina, 1940, J. D. KINARD and M. J. PETERSON (*South Carolina Sta. Bul.* 340 (1942), pp. 30, figs. 3).—Topics presented include the use of credit, type of farming, land-use and farm practices, a financial summary showing farm receipts, expenses, income, and labor income, and a discussion of factors affecting farm labor income.

Distribution of farm income by size, L. O. BERCAW and H. E. HENNEFRUND (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog.* 96 (1942), pp. IV+103).—“This is a selected list of references on the distribution of farm income by income groups. Although it covers the years 1931-1941, inclusive, a very few references to publications of an earlier date have been included. As the emphasis throughout is on the distribution of income by size, or income groups, the list does not contain references on the income of the average or the individual farm. No attempt has been made to include references to all of the numerous farm business and farm management reports which have been issued, many in mimeographed form. A few general references and a few on the distribution of urban income are given in a separate list at the end of the main part of the bibliography.” A total of 269 references, an author index, and a brief subject index are included.

Type of farm tenancy areas in Texas, J. R. MOTHERAL. (Coop. Tex. Expt. Sta.). (*U. S. Dept. Agr., Bur. Agr. Econ., 1941, pp. [2]+42, figs. 16).*—The author points out that for the State as a whole the rate of farm tenancy increased from 38 percent in 1880 to 61 percent in 1930, largely due to land speculation, economic depressions, and conditions of credit, coupled with a steady breaking up of early land grants and their acquisition by heirs who were not themselves farmers or who lived away from the inherited land. Types of tenancy, in terms of the kind of rent paid, became identified with certain types of farms, as for example, sharecroppers on cotton farms, cash renters on dairy and stock farms, and managers on fruit farms. After a set of definitions of terms there is presented a description of how the areas were delineated. Accompanying are a number of maps and tables.

Principal methods of share renting and compensation for unexhausted improvements in four type-of-farming areas in Indiana, O. G. LLOYD, H. S. MORINE, JR., and J. R. HAYS (*Indiana Sta. Bul.* 464 (1942), pp. 24, figs. 9).—The three principal methods of share renting in the four areas studied are half-stock-share, half-crop-share, and two-fifths-crop-share. Stock-share rent is paid from both grain and livestock income and is most frequently associated with adequate permanent improvements, considerable livestock, and soil conservation. Crop-share rent is paid from crops, and cash may be paid for hay and pasture ground. There is a tendency for crop-share renting to be associated with inadequate permanent improvements, little livestock, and soil exploitation. More than two-thirds of all renters interviewed had made some improvement upon the farm from which they had moved. More than four-fifths of those making improvements had received payment for them. However, nine-tenths of the payments had been received previous to the final settlement. The principal methods of crop-share renting are associated with the type of soil or the natural productivity of the land. The half-crop-share is most common on the most productive soils of the area, and the two-fifths-crop-share

most common on the less productive soils or overflow land where there is greater risk of losing a crop. The half-stock-share is more dependent on the type of farming than the type of soil. The stock-share landlord on any type of soil has a better opportunity to increase his income by the use of his capital and management for more intensive farming than does the crop-share landlord.

Farm rental agreements in Caswell County, North Carolina, D. M. PETTUS. (Coop. N. C. State Col.). (*U. S. Dept. Agr., Bur. Agr. Econ., 1940, pp. [4]+27, fig. 1*).—In the rental arrangements discussed it was found that very little attention is given to the production of crops and livestock for home use. All rental arrangements should provide for adequate acreage of suitable gardens, and an attempt should be made to secure pasture and cropland for the production of livestock and livestock products for home use. Although most of the farmers indicated that June or July was the month in which rental agreements should be made, about half of the rental contracts had been made at other times. The tenant should have a definite understanding with his landlord that, unless one party notifies the other by a certain date (at least 6 mo. before the crop season starts), the rental agreement shall continue for an additional year. Maintenance and improvement of the fertility of the soil is of special concern to landowners. The amount of credit that the tenant needs and the interest rate that he will pay should be stated definitely in the rental agreement. Some of the landlords take a personal interest in their tenants' welfare and charge no interest on loans to them. All expense items should be included in a rental contract. It is advisable for both landlord and tenant to keep records of their farm operations, and, particularly, for them to keep an account of the expenses and receipts that they share jointly. The adoption of written leases that promote good farming practices in place of the indefinite oral agreements now in use would be a considerable step toward improving the tenancy situation. The first obstacle to the written lease is the distrust that many of the tenants and some landlords have of written agreements. A second is the inability of some of the farmers to read. The third obstacle that may prevent some landlords from signing a lease is the fact that some tenants have no collateral.

Appendixes deal with methodology and procedures and a suggested farm agreement form.

Agricultural labor in the United States, 1938–June 1941, J. M. McNEIL and J. C. FOLSOM (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 95 (1942), pp. VI+268*).—This bibliography of 690 selected references supplements and brings up to date earlier bibliographies (E. S. R., 79, p. 698). "It contains references on the general agricultural labor situation in the United States; employment, unemployment, supply and demand, wages, hours, and working conditions; mechanization of agriculture and the displacement of agricultural workers; laws and legislation relating to agricultural laborers; farmer-labor controversies, including labor organization, farmer opposition to labor organization, and strikes; occupational hazards to which farm laborers are subjected; employment and placement services for farm laborers; rehabilitation and relief of farm laborers; and social insurance, including workmen's compensation, and other statutory protection. References relating to special groups of agricultural laborers—child laborers, migratory laborers, sharecroppers, Negroes, peons and peonage, and unemployed rural youth—are included." News items, editorials, and unsigned articles are, with a few exceptions, omitted, as is also the list of periodicals relating to agricultural labor included in the two previous bibliographies. An author and subject index is included.

Tax delinquency on rural real estate, 1928–1941, H. E. HENNEFEUND (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 94 (1942), pp. VI+314*).—

This bibliography brings the one on taxation and the farmer (E. S. R., 59, p. 884) up to date. It contains 742 selected references "to books, pamphlets, and periodical articles published since 1928 on the subject of tax delinquency on rural real estate in the United States, including its extent, causes and remedies, forfeiture of lands, tax sales, and redemption procedure." References to laws dealing with the problem of tax delinquency and the collection of delinquent taxes are not included, but some references are made to discussions of enactment of the legislation. "The references are arranged by States, groups of States, and territories, preceded by a general section and followed by the list of sources for legislation. A subject and author index is appended."

State tax collections and allocations, by parishes, 1938, Louisiana, B. M. GILE, C. ARNY, and H. V. LOTT (*Louisiana Sta. Bul. 337 (1942), pp. 30, figs. 2*).—"This report contains data showing the approximate amount of taxes collected by the State of Louisiana in 1938, an estimate of the proportion of these revenues originating in each parish, and the amount of money paid by the State to the parishes for aids in the support of parish schools, health units, emergency relief, public welfare programs, and for homestead exemptions and other purposes authorized by law. The data on tax revenue collected in Louisiana during 1938 were obtained from the official record." Tables show the 31 main sources of tax income collected by the State; the taxes paid per capita, by parishes; total amounts paid the parishes by the State for different purposes; tax collections and payments by the State to parishes, by parishes; estimated amount collected by parishes through sources producing 77.6 percent of the total State collections; and payments to parishes by the State, classified by purposes.

The total tax revenue collected by the State from the 31 sources was \$65,088,505, and the total payments by the State to the parishes was \$26,996,710. Of the 64 parishes, 11 received from \$101.70 to \$189.51 from the State for each \$100 of tax revenue originating in the parishes. Twenty-seven parishes received from 50 ct. to \$1 for each \$1 paid to the State, 8 being from 75.4 to 93.6 ct., and 26 parishes received less than 50 ct. per \$1 paid the State, of which 11 were between 14.9 and 35.16 ct.

Tariff rates on principal agricultural products, C. F. WELLS (*U. S. Dept. Agr., Bur. Agr. Econ., rev., 1941, pp. [2]+88*).—This report represents a complete history of the tariff status of each commodity from September 22, 1922, the effective date of the 1922 Tariff Act, through January 10, 1941. See also a previous note (E. S. R., 65, p. 783).

The incidence of tariffs on competing products, C. F. WELLS (*U. S. Dept. Agr., Statis. and Agr. No. 2 (1941), pp. [2]+28, figs. 5*).—The purpose of this paper is to put in explicit form a mathematical solution of the problem of determining the price and quantity incidence of tariffs on competing products and to offer a graphic solution of the same problem.

Economic history of cotton production in Tennessee, C. E. ALLEN and B. D. RASKOFF (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 130 (1941), pp. IV+54, figs. 17*).—This is a source book for those concerned with cotton production in Tennessee.

Improving low incomes on tobacco farms, Caswell County, North Carolina, R. E. GRAHAM, JR. (Coop. N. C. Expt. Sta.). (*U. S. Dept. Agr., Bur. Agr. Econ., 1941, F. M.-24, pp. [4]+59, fig. 1*).—Some conclusions reached are that well-balanced farm organizations, with systematic crop rotations and several sources of living from the farm, as well as for cash income, will provide the basis for farm adjustments; the livestock production rates on the farms studied are very low, and the efficiency of the livestock enterprises must be increased

if they are to net a satisfactory return; and the home-management and farm-woodland phases of the existing farm plans are inadequate.

Costo de produccion de tomates en Jayuya, Puerto Rico, 1939 y 1940, L. M. GÉIGEL (*Puerto Rico Univ. Sta. Mimeog. Rpt. 17 (1941), Span. ed., pp. [2]+16, figs. 4; Eng. abs., pp. 15-16*).—The total cost of producing a cuerda (0.9712 acre) of tomatoes in Jayuya averaged around \$75 for both crop years. These costs varied from \$50 to \$125 per cuerda for the 2 yr. studied. The average gain per cuerda for the crop year 1940 was \$90, which was almost twice that obtained for the crop year 1939. The average farm price received per hundred-weight of tomatoes was \$4.22 for the crop year 1940 and only \$1.60 for the previous crop year. The average yield for the crop year 1940 was a little less than half that obtained for 1939. The most important factor affecting costs and returns of tomatoes in Jayuya was yield per cuerda.

Some economic aspects of the frozen fruit industry in Tennessee, B. H. LUEBKE and J. R. KELLEY (*Tennessee Sta., Agr. Econ. and Rural Social Dept. Monog. 133 (1941), pp. [1]+II+24, figs. 18*).—According to this discussion, the number of farms in Tennessee reporting small fruits decreased 38 percent from 1919 to 1939. Large losses occur annually to both producers and consumers due to decayed fruit. It has been demonstrated that freezing will reduce much of this loss. Total refrigerated warehouse space in Tennessee was 9,945,000 cu. ft. in June 1941. It has practically trebled since 1921.

Factors affecting profits from dairy herds, D. M. SEATH and E. W. NEASHAM (*Louisiana Sta. Bul. 338 (1942), pp. 15, figs. 3*).—Analysis was made of the monthly and yearly dairy herd improvement association records for 32 herds in 1938, 33 herds in 1939, and 25 herds in 1940. Some of the findings follow.

Each 1,000-lb. increase in the yearly yield of milk increased the returns per cow over feed costs \$21.30. Each 100-lb. increase in butterfat yield increased the return per cow \$44.96. The 3-yr. average showed that, while it costs more to feed high-producing cows, each \$1.00 increase in feed cost increased the return over feed cost \$2.40. The 11 high-producing herds for 1938 averaged 66 percent higher in feed costs but returned 69 percent more over feed cost per cow than did the 11 low-producing herds. Feeding grain at the rate of 1 lb. to each 3.0 to 3.4 lb. of milk produced was most profitable, while the heaviest feeding (1.0 to 1.4 lb. and under of milk) was the least profitable. The poor-pasture months ranked lowest in average production of milk and in returns over feed cost. Monthly milk and butterfat averages for herds showed a close relationship to the percentage of cows dry within herds. Good pasture and roughage increased production and returns over feed costs per cow.

The competitive position of dairying in southern New England, H. C. FOWLER (Coop. Mass. and [Conn.] Storrs Expt. Stas. et al.). (*U. S. Dept. Agr., Tech. Bul. 812 (1942), pp. 51, figs. 7*).—"This bulletin is concerned with the future trend of dairying in southern New England. It throws some light on the question of whether local dairymen will be able to compete successfully with outside producers for southern New England markets for milk and cream." The agriculture of the areas and its development are described. The recent trends in dairying—milk production per farm, number of dairy cows, production per cow, replacements, grain purchases, feed production, etc., are discussed. Using 1936 farm records for 3 groups of farms—42 farms in Worcester County, Mass., 42 farms in Tolland and New London Counties in eastern Connecticut, and 15 farms in Hartford County, Conn., in the Connecticut River Valley—analysis is made of the probable response in the area by 1946 under 3 milk-producing situations—A, 1936 prices continuing; B, 1946 prices to be about 15 percent higher than 1936 prices; and C, 1946 prices to be 15 percent lower than 1936

prices. The analysis is made by the budget method, which "technic involves the comparison of returns from several alternative organizations for a number of representative farms."

The estimated index numbers (1936=100) of milk production in 1946 for the four areas—Massachusetts, eastern Connecticut, Connecticut River Valley, and southern New England—are, respectively, 103, 110, 106, and 109 with milk prices the same as in 1936; 128, 130, 123, and 128 with 1946 prices 15 percent higher than 1936 prices; and 85, 92, 90, and 89 with 1946 prices 15 percent lower than 1936 prices.

"The long-time trend of milk production in southern New England has been upward and will probably continue in that direction during the coming decade. . . . Further expansion of milk production is possible for several reasons. Considerable roughage is now fed to young stock. Some of this would be fed to mature cows if a shortage of milk should develop. The possibilities of expanding production by keeping more cows and feeding grain more intensively have not been exhausted. The expansion could be made without increasing the supply of roughage. Yields of hay on many farms could be doubled without increasing the production cost on a per-ton basis. The present barn space is not being used to capacity. Motortrucks and hard-surfaced roads have given all of southern New England access to some of the best fluid milk markets in the world.

"Other forces are at work, however, that are tending to limit this expansion of milk production. In the first place, the demand for fluid milk is not very elastic, and with a relatively stationary population a larger volume of production would be sold at lower prices. Then, land suitable for dairying is in good demand for other purposes. Many dairy farms have been sold recently to persons who use them mainly as summer homes, and the part-time farming movement made possible by automobiles is expected to make further inroads. Other farm enterprises, like poultry keeping and the raising of cash crops, will outbid dairying for the use of some of the available resources."

The supply and utilization of milk in Indiana, C. M. HARDIN. (Coop. U. S. D. A. et al.). (*Indiana Sta. Bul.* 462 (1941), pp. 47, figs. 19).—During 1939, a total of about 3 billion lb. of milk (in terms of 4-percent milk equivalent) was delivered to Indiana plants in the form of whole milk or cream or was sold from farms as butter. About 57 percent of this was in the form of whole milk, 42 in the form of cream, and slightly less than 1 percent in the form of farm-made butter. Nearly half of the milk and cream which was received by Indiana plants during 1939 was used in the manufacture of butter. Cheese plants in Indiana average about four times as large as cheese plants in Wisconsin. There were 13 organizations which were regional or national in scope which operated in Indiana in 1939, handling about half of the combined milk and cream receipts for the State. Five of the organizations operated an average of 7.4 plants per firm, and handled a third of the total receipts.

An economic analysis of fluid milk markets in Indiana, C. M. HARDIN. (Coop. U. S. D. A. et al.). (*Indiana Sta. Bul.* 463 (1941), pp. 55, figs. 5).—The author discusses the organization of the fluid milk industry, the extent of control, prices and supply in the fluid milk markets, and the consumption of fluid milk and cream. Market comparisons and a statistical summary are also presented.

The New Orleans market for fluid milk, R. M. GRIESBY and R. A. BALLINGER (*Louisiana Sta. Bul.* 339 (1942), pp. 22, figs. 4).—Within the past 2 yr. there has been a very rapid increase in the total amount of fluid milk reaching the New Orleans market. The increase in the amount used for class I purposes has

been only slight, but much larger quantities are being used for class II and class III purposes. Much of the effect of recent increases in class I prices to shippers seems to have been offset by increases in the amount of milk entering classes II and III. Consequently, there has been little, if any, increase in the average price received by shippers for all of their milk. Whenever the dealers are required to increase the price they pay for class I milk, they are likely to raise the prices charged consumers for fluid milk; otherwise their margins would be reduced. Such increases in prices almost certainly mean that consumers purchase less milk than they would at lower prices. This has the effect of reducing or limiting the amount of milk which shippers can sell as class I.

The Great Plains and the supply of wheat, O. J. SCOVILLE and J. W. GIBSON (*U. S. Dept. Agr., Bur. Agr. Econ., 1941, F. M. 23, pp. [1]+27, figs. 7*).—This is a discussion of the contribution of the Great Plains to our national wheat supply.

Some factors affecting fertilizer consumption, A. P. BRODELL and M. R. COOPER (*U. S. Dept. Agr., Bur. Agr. Econ., 1940, F. M. 10, pp. [1]+29, figs. 5*).—This report shows significant trends which have taken place in fertilizer and plant-food consumption in the United States between 1880 and 1938 and analyzes the factors causing these trends.

Selected problems in the law of water rights in the West, W. A. HUTCHINS (*U. S. Dept. Agr., Misc. Pub. 418 (1942), pp. XV+513*).—This is a study of water law made under the supervision of the Solicitor of the Department of Agriculture in cooperation with the Bureau of Agricultural Economics, the Soil Conservation Service, the Farm Security Administration, and the Water Facilities Board to help meet the needs of the Department in its relations to irrigation, drainage, forest conservation, soil erosion control, the stabilization of watersheds, and the promotion of soil and water conservation.

Interrelationship of land uses in rural Massachusetts, D. ROZMAN (*Massachusetts Sta. Bul. 387 (1941), pp. 48, figs. 25*).—The classification of land on the basis of soil and topography indicates that half the total area of the State is suitable for agricultural utilization. In 1880, before the decline in the agricultural land area set in, 41 percent of the State area was represented by improved farm land. In 1940 this proportion had declined to 15 percent. The major local land-use factors responsible for the decline of improved farm land relate, in varying degrees, to changing types and systems of farming; soil erosion and deterioration; nonresident landownership; disappearance of town industries; and growth of residential, recreational, commercial, and other more intensive uses of land. Of the total State area, nearly two-thirds is under wooded cover. The highest proportion (nearly three-fourths) is in Barnstable and Berkshire Counties, and the lowest (slightly more than half) is in Essex and Middlesex Counties. The average value per acre of farm land and buildings is \$37 in the lowest third of the towns below 10,000 population and \$284 in the highest third.

[Reports of the Administrator of the Agricultural Adjustment Administration, 1939, 1940, and 1941], R. M. EVANS (*U. S. Dept. Agr., Agr. Adjust. Admin. [Rpt.], 1939, G-96, pp. XI+142; [Rpt.], 1940, G-104, pp. V+154; Rpt., 1941, G-113, pp. IV+90*).

The effects and implications of the agricultural conservation program in east north central Kansas, 1937-1938, K. W. MILLER. (Coop. U. S. D. A.). (*Kansas Sta., Agr. Econ. Rpt. 3 (1940), pp. [2]+34, figs. 5*).—According to this report the operation of the agricultural conservation program in 1937 and 1938 made little difference in farm practices and production in east north central Kansas. Incomes of participating farmers were higher in both 1937 and 1938 than those of nonparticipating farmers by about the amount of the program payments. The adoption of the recommended cropping system in line with

objectives of the program, in which 25 percent of the cropland would be kept in legumes and grasses, would decrease the combined production of cash and feed grains by approximately 15 percent of the 1928-32 base and would increase alfalfa by 40 percent. The agricultural conservation program can be improved by education regarding the program and more conservation practices, especially seeding permanent grasses and legumes.

Changes on wheat farms in southwestern Kansas, 1931-37, with special reference to the influence of AAA programs, H. L. STEWART. (Coop. Kans. Expt. Sta.). (*U. S. Dept. Agr., Bur. Agr. Econ., 1940, F. M. 7, pp. [3]+84*).—Low prices in 1931 and 1932, followed by extremely low crop yields during the period of drought from 1933 to 1937, induced, and in many cases forced, southwestern Kansas wheat farmers to make adjustments in the organization of their farms. Drought has been the major hazard of crop production, but soil blowing, hail, torrential rainfall, insects, and plant diseases increased the risk of crop production in the area. Nearly all farmers in the area participated in the various Agricultural Adjustment Administration programs. Changes in the organization of farms included (a) an elimination from farming in the area of about one-fifth of the cooperators, primarily those who owned little land or who, because of excessive indebtedness, owned their land in name only and consequently had little capital goods they could consume; (b) a decrease in the size of farms with a small acreage of cropland and a shift of small-crop operators to grassland vacated by operators who quit farming; (c) an increase in the size of farms with a large acreage of cropland through an acquisition by the large-crop operators of cropland vacated by operators who quit farming and by small-crop operators who shifted to vacated grassland; (d) a shift from corn production to sorghum production, and a slight reduction in wheat acreage with a concomitant increase in idle and fallow acreage; (e) a reduction of all classes of livestock except milk cows; and (f) a slight decrease in the number of combines and an increase in the number of tractors and light trucks.

Agricultural relief measures relating to the raising of farm prices—73rd Congress, March 9, 1933 to June 18, 1934, M. E. WHEELER and M. I. HERB (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 92 (1941), pp. VI+80*).—This is the sixth bibliography of the series previously noted (*E. S. R., 83, p. 553*). The 107 references are grouped under the following headings: Agricultural Adjustment Act of 1933, cost of production, export debentures, marketing control, miscellaneous, price fixing, prices—parity, processing taxes, production control, sugar program, and surplus disposal. The usual index of authors and subjects and the numerical index of public laws, bills, and resolutions are included.

The rise of retail food prices in Puerto Rico, S. L. DESCARTES (*Puerto Rico Univ. Sta. Mimeog. Rpt. 20 (1941), pp. [1]+10; (1942), Sups. 1, pp. 4; 2, pp. 3*).—Retail food prices in Puerto Rico increased 36 percent between the time war was declared in September 1939 and December 1941. The index number of retail food prices was 136 in November 1941. The month of July 1939 was taken as equal to 100. The highest increase has occurred in the prices of tomatoes, which were two and one-half times higher in November 1941 than in July 1939. There was an important rise in the price of sugar from 111 in July 1941 to 122 in November 1941. The smallest increase occurred in eggs and coffee. The increase in retail prices of imported foodstuffs was 50 percent, and in locally produced foods the increase was 21 percent.

Paying producers for fat and solids-not-fat in milk, R. K. FROKER and C. M. HARDIN (*Wisconsin Sta. Res. Bul. 143 (1942), pp. [2]+48*).—The purpose of this study is to develop an equitable method of pricing the fat and solids-

not-fat in milk as it is delivered from producers to dairy plants and used for various purposes. The study is concerned primarily with the distribution of market proceeds, and no attempt is made to effect changes in the general price of milk or to the total amount of money available for distribution.

"All payment plans developed in this report follow the general pattern of pricing milk on a hundredweight basis with adjustments in price as the test of milk varies among individual patrons. This means that in Wisconsin the price will be quoted per hundredweight of milk testing 3.5 percent fat with an adjustment or differential for each 0.1 percent increase or decrease from this standard. The size of the adjustment per point of test variation should be determined by the market value of units of fat and solids-not-fat and costs related thereto."

Price spreads between the farmer and the consumer: Supplement to the mimeographed report of July 1936, R. O. BEEN and F. V. WAUGH (U. S. Dept. Agr., Bur. Agr. Econ., 1941, pp. [2]+71, figs. 3).—This brings up to date the previous report (E. S. R., 81, p. 440) and shows that the farmer's share of consumer expenditures for domestic food products continued to increase through 1940.

Case studies of agricultural cooperatives in Knox County, Tennessee, C. E. ALLRED, B. H. LUEBKE, and A. K. SCHMIDT (Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 134 (1942), pp. [1]+III+31, figs. 5)—Records were obtained on 24 farmers' organizations operating in Knox County at one time or another, from 1910 to 1941. About one-half of the organizations studied were started by the farmers' own efforts and leadership, while others were assisted by the Tennessee Valley Authority, University of Tennessee, and the U. S. D. A. Farm Credit Administration. An important difficulty encountered by marketing associations has been that of obtaining sufficient volume of business in an area with a good local market. Another difficulty is that many farms are small part-time units which sell only a limited amount of products.

Personnel management in farmers' cooperatives, R. G. BEERS (U. S. Dept. Agr., Farm Credit Admin. Cir. C-123 (1941), pp. [2]+II+35).—This circular is designed to provide farmers' cooperatives with information obtained in a special survey of the personnel management problems, policies, and practices of other agricultural cooperatives. The subjects covered were: (1) The filling of vacant jobs; (2) training; (3) pay; (4) the measurement of the efficiency with which employees do their work; (5) vacations and sick leave; (6) the provision of stable year-round work for trained employees; (7) health, safety, and physical working conditions; (8) the general welfare of employees; (9) the maintenance of effective working relationships with employees; and (10) the placing of responsibility for personnel management. Although there is no evidence that any one of the 42 cooperatives in 18 States that participated in the survey has found the best possible solutions to all its personnel problems, most of them are striving to follow what appear to be sound personnel management policies. Moreover, having given considerable attention to determining sound policies and using them objectively in everyday operations, a number of these cooperatives maintain exceptionally effective personnel management programs.

Resultados financieros de las cooperativas de mercadeo de hortalizas en Puerto Rico, 1939-40 [Financial results of the cooperative marketing of truck crops in Puerto Rico, 1939-40], J. MAISONET (Puerto Rico Univ. Sta. Mimeog. Rpt. 18 (1941), Span. ed., pp. [2]+16; Eng. abs., pp. 15-16).—The Isabela and Jayuya cooperatives operated very successfully. Their volume of sales, made up almost exclusively of export sales in the New York market, amounted to \$40,717 and \$28,874, respectively. Tomatoes were the main export crop in Jayuya, and cucumbers in Isabela.

Cooperative canning of fruits and vegetables, N. FOGELBERG and W. G. LEITH (*U. S. Dept. Agr., Farm Credit Admin., Coop. Res. and Serv. Div., Bul. 47* (1941), pp. VI+78, figs. 21).—The output of canned fruits and vegetables in the United States in 1939 was nearly 250 million cases valued at almost half a billion dollars. In 1940 there were in the United States, Hawaii, and Puerto Rico about 1,900 fruit and vegetable canning organizations, operating 2,500 canning plants. Some of these plants are to be found in nearly every State, and California, Indiana, Maryland, and Virginia each had over 200. Some fruit or vegetable is being canned cooperatively during each month of the year. Individual associations operate from about 3 weeks to all the year, and citrus fruits, cranberries, and olives are canned over long periods of time. Some associations increase the length of their operating season by canning several products. The number of different kinds of fruits and vegetables canned by a single cannery ranged from 1 to 25, but it was uncommon for more than 3 or 4 products to be canned at the same time. The cooperative canneries extend their services to growers beyond the processing of fruits and vegetables. A few extend production credit. Many purchase supplies for their members. Most of the large associations and a few of the smaller ones provide horticultural service. Some also engage in cold packing, quick freezing, and drying. The financial condition of the cooperative canneries generally is good, but the larger associations usually are in better condition than the smaller ones. The annual sales volume of the cooperative fruit and vegetable canneries ranged from \$1,855 to \$2,432,704 for the three-season period ended with 1938-39. The usual hazards of cooperative organization seem intensified in the canning of fruits and vegetables; consequently, there is need for more than ordinary caution and foresight.

A survey of cooperative poultry and egg marketing in Kansas, P. WILSON. (Coop. U. S. D. A.). (*Kansas Sta., Agr. Econ. Rpt. 1* (1940), pp. [2]+20, figs. 3).—A survey of 28 cooperatives, including 7 elevators, 9 stores, 4 produce houses, 1 creamery, 1 poultry and egg cooperative, and 6 turkey pools, indicated that patrons of Kansas cooperatives marketing poultry and eggs were primarily grain and livestock farmers. More than one-half of them had flocks of less than 200 hens. Few producers had egg-cooling facilities on their farms. Of the 22 associations marketing eggs, 2 regularly delivered eggs from the farm to the cooperative and 2 others performed this service occasionally. One association handled eggs on a graded basis. Two purchased eggs according to weight. Eggs were purchased outright by 21 associations and were handled on a pool basis by 1 association. Packers and concentrators were the principal outlets for poultry. Fourteen associations shipped some or all of their poultry to terminal markets. Average poultry and egg sales for the 13 associations were \$18,123.62. In general, little effort was being made by cooperatives to assist producers in improving the quality of poultry products marketed.

Distribution of milk by farmers' cooperative associations, L. F. HERMANN and W. C. WELDEN (*U. S. Dept. Agr., Farm Credit Admin. Cir. O-124* (1941), pp. [2]+II+72, figs. 25).—The number of organized cooperatives for milk distribution has been increased in recent years. Most associations have been growing in volume of sales and in financial strength. Many of them are among the larger dealers in their markets and are selling a large share of their members' milk in the higher-priced sales outlets. However, there are many pitfalls and possibilities for failure in cooperative milk distribution. The financial investment is unusually heavy—close to 75 ct. for each \$1 of annual income or \$8 for each daily pound of milk sold. The chances of failure are enhanced somewhat by keen competition for sales volume and by the

complex nature of a city business. Many associations depart in varying degrees from recommended cooperative practices. An outstanding finding of this survey of 177 associations was the failure of any cooperative standard or pattern to emerge. Some associations, through unwise purchasing or building, have unusually heavy capital investments, an effect which can be minimized by a large volume of surplus to spread overhead costs and also by economizing on the all-important item of labor costs. It is suggested that cooperative groups may greatly lessen the strain of getting started by taking advantage of special opportunities at the outset to acquire sales outlets and facilities at especially favorable terms. Inevitably, there is a complex relation between investment, sales methods, operating costs, and prices to producers in a milk-distributing business.

If a milk-distributing cooperative is to succeed as a permanent marketing agency, particular attention should be given to such matters as keeping the membership rolls in good shape, keeping financing and patronage properly coordinated, and keeping the finances and operating facilities in shape to meet changes that may come in market methods.

Distribution of machinery by farmers' cooperative associations, G. M. FRANCIS (*U. S. Dept. Agr., Farm Credit Admin. Cir. O-125 (1941), pp. [4]+57, figs. 11*).—Retail cooperatives described in this circular have not had outstanding success thus far in selling farm machinery and obtaining savings. Volume of machinery sales, averaging less than \$10,000 per association for 18 cooperatives operating under wholesale cooperative associations, was in most cases insufficient to provide enough income to cover all costs. The average sales of about \$50,000 in 6 associations that bought direct from manufacturers of machinery came nearer to meeting volume requirements. Gross earnings, however, were insufficient in almost all cases to cover direct costs of machinery selling, servicing, and general overhead and to afford a savings refund. None of the retail cooperatives have made special refunds of earnings on machinery sold. Machinery service by wholesale organizations has brought definite advantages to the whole cooperative machinery program. It tends to provide an exclusively co-op line over a large territory which reduces the degree of direct competition among cooperatives that might otherwise handle different brands of competing machinery. It also frees local cooperatives from pressure by manufacturers to employ their competitive selling and credit methods and has enabled the associations to develop methods more consistent with cooperative practice. This study suggests that there is an opportunity for farmers to reduce their outlays for machinery and equipment by fuller support of the cooperative machinery program. Since farmers on the average make their largest annual cash expenditure for machinery, it appears that more cooperative purchasing in this field will be of increasing benefit to them.

Business stability of Iowa farmers' elevators, E. B. BALLOW. (*Coop. Iowa State Col. (U. S. Dept. Agr., Farm Credit Admin., Coop. Res. and Serv. Div., Bul. 44 (1941), pp. VIII+111, figs. 16*).—The financial and operating facts and the discussion of their significance as presented in this publication were derived largely from a study mostly concerned with the operating experiences of 92 representative Iowa farmers' elevators which had survived the 10-yr. period 1929-38.

In 1937 the combined assets of all Iowa farmers' elevators represented an estimated investment of approximately \$11,000,000, or an average approaching \$32,000 per elevator. The equity of members in these assets was about 75 percent. Land, buildings, and equipment (depreciated) made up 86 percent of the total assets.

On the whole, farmers' elevators in Iowa are deemed conservative in their business operations, grain marketing being their primary function. However, like similar organizations in other grain States, they purchase for patrons large quantities of farm supplies, including petroleum products; market and ship livestock; grind and mix feeds; clean and treat seeds; store grain; and provide trucking and other facilities. Efficiency of operations is reflected in very low marketing costs to the growers made possible under the prevailing operating margin of about 2 ct. per bushel. For associations in all areas the 10-yr. average gross income from grain represented only 47 percent of total gross operating income and ranged from 33 percent in 1931 to 55 percent in 1934. However, one-third of the associations generally showed greater income from oats than corn.

Machine and hand methods in crop production, A. P. BRODELL (*U. S. Dept. Agr., Bur. Agr. Econ. and Agr. Market. Serv., 1940, F. M. 18, pp. [1]+16*).—The author discusses the use of power for seedbed preparation, small grain production, and heavy-duty work with corn; mechanical power in cotton production; and the use of work stock in various operations.

Use of farm tractors in Minnesota, T. R. NODLAND, A. J. SCHWANTES, and R. V. BAUMANN. (*Coop. Minn. Expt. Sta.*). (*U. S. Dept. Agr., Bur. Agr. Econ., 1940, F. M. 11, p. [2]+31, figs. 3*).—Approximately 40 percent of the drawbar horsepower available on Minnesota farms was furnished by tractors in 1938. Most tractors in use had been bought since 1934, and the largest number were bought in 1936 and 1937. One-half of the tractors used gasoline exclusively, and about 35 percent used distillate. Kerosene has been largely replaced by gasoline and distillate in recent years. The drawbar rating of the tractors ranged from about 6 hp. to 61 hp. Tractors of 12 to 18 hp. predominated. Although 50 percent of the farms studied reported some custom work, it amounted to less than 10 percent of all tractor work. Horses were used for about 80 percent of the on-farm hauling, but were of minor importance for off-farm hauling. Corn cultivating was done with tractors on about 65 percent of the farms. Grain seeding was done on about 45 percent of the farms, and grain harvesting on 90 percent. Farmers preferred horses for light work like haying, planting corn, and hauling manure. Tractors were preferred for heavy work, especially plowing, disking, and spring toothling. Farmers considered the cash outlay necessary to obtain and operate a tractor as its major disadvantage, especially if they are getting low prices for farm products.

The tractor and its effects on farming in Minnesota, R. V. BAUMANN, T. R. NODLAND, and G. A. POND. (*Coop. Minn. Expt. Sta.*). (*U. S. Dept. Agr., Bur. Agr. Econ., 1940, F. M. 13, pp. [2]+27, fig. 1*).—Tractor numbers increased threefold in Minnesota from 1925 to 1938. During this same period, horse-and-mule numbers in the State decreased 20 percent. A study of 709 tractors on 581 farms in five of the major type-of-farming areas in Minnesota indicated that tractor farms were larger than other farms, and, where increases in size were noted, the rate of increase was greater on tractor farms. Approximately one-fourth of the drawbar power on tractor farms was furnished by horses. There has been an increase in the number of farmers who operate noncontiguous tracts since the purchase of the tractor. Most of the interviewed farmers were using a combination of horses and tractors on their farms. Farmers in southern Minnesota financed the purchase of new tractors by means of promissory notes, chattel mortgages, and time payments less frequently than did farmers in the Red River Valley or in central Minnesota.

A study of the power used on 62 Pennsylvania farms, 1938, B. R. HORT. (*Coop. Pa. Expt. Sta.*). (*U. S. Dept. Agr., Bur. Agr. Econ., 1940, F. M. 12,*

pp. [2]+21, fig. 1).—The subjects presented include a description of the farms and areas; the use of tractors, horses, and farm motortrucks; and the adjustments made by farmers in the organization of their farms following the substitution of tractor power for horsepower.

Motor transportation of livestock, G. F. HENNING and E. B. POLING (*Ohio Sta. Bul. 625 (1941), pp. [1]+49, figs. 4*).—The increased movement of livestock by truck in the United States in different regions and by different markets is discussed. Data for the years 1937–40, inclusive, obtained from the Producers Cooperative Commission Associations for the three principal livestock markets of Ohio—Cleveland, Columbus, and Cincinnati—are analyzed to show the area from which livestock is trucked, the trends in motor transportation rates for livestock, cost of marketing livestock from the farmer to the processor, etc. Some of the findings and conclusions are:

“During the past decade, rates for transporting livestock have declined perceptibly in Ohio. In 1929, they were, on the average, about 70 percent higher than during the years 1937 to 1940. . . . From analyzing the rates in this study from as many as 320 communities in Ohio, it does not seem possible to draw any conclusions that rates follow any definite pattern. As a matter of fact, one would be inclined to believe that rates up to the present have been influenced as much by custom as by any other factor. . . . It is a safe conclusion that up to the close of 1940, motor rates for livestock transportation in Ohio were not dependent upon distance as an important factor. In fact, both observation and statistical measurements show no correlation. . . . Although motor rates do not increase with distance as railroad rates do, at the longer distances, for example, 100 to 175 mi., from the market, the two rate structures tend to approach each other. . . . In the motor transportation of livestock, a factor which showed more relationship than distance was the density of livestock. . . . Although many of the rates are charged by truckers on a hundredweight basis, there is no degree of uniformity in the system for all species or all communities.

“Assuming that rates will remain on or about the present level and will ignore distance as a factor up to 125 to 150 mi., some considerations seem logical concerning livestock marketing. First, such markets as Cleveland, Columbus, Cincinnati, and Dayton will be favored in holding their present truck volume. When the distance principle is ignored, these markets have an advantage over other markets. Second, smaller markets peculiarly or advantageously located will be able to enlarge as far as motor transportation rates are concerned. If this is a significant enough advantage, larger markets may develop within the decentralized areas, those areas that are not normally within the trucking areas of the terminal markets but must use rail facilities to reach them. Also, sizable, well-located auctions may be slightly favored to develop in the future from the present situation of many local auctions, concentration yards, packer buying points, and local markets. Third, if it is assumed that in the future, motor rates will recognize distance and be somewhat higher for the longer distances, terminal markets, such as Cincinnati and Cleveland, will be placed at a greater disadvantage than at present, and markets at country points will be placed in a somewhat favored position compared with the present situation. Such a development would mean the probable enlargement of the country markets. Whether rates will continue in the future along their present pattern only time will tell, but they should be observed and studied, for they can be favorable or unfavorable to certain parts of the livestock marketing system.”

Market preferences and quality analysis of Kansas potatoes as determined by a study of retail markets and restaurants in six Kansas cities and among

dealers at terminal markets in mid-1940, F. L. PARSONS and W. H. WINNER. (Coop. U. S. D. A.). (*Kansas Sta., Agr. Econ. Rpt. 5* [1940], pp. [2]+19).—This survey indicates that consumers today demand high-quality, clean, uniform, and attractively packaged potatoes. They purchase potatoes in smaller quantities than formerly and ask for a U. S. No. 1 grade or for particular varieties in standardized packs. Kansas potatoes were handled extensively in Kansas retail markets during July, August, and early September and used extensively in Kansas restaurants during July 1940. An increasing use of cold-storage facilities by growers in commercial potato-producing areas is extending the marketing season somewhat in certain areas. The estimated loss from decay and other defects was 5.2 percent on Kansas and 3.7 percent on shipped-in potatoes. More than two-thirds of the retailers said the keeping quality was poor, chain store retailers, in particular, objecting. During the summer months, most retailers packaged their potatoes in 10- or 15-lb. paper bags before the customers arrived. A majority of the dealers thought Kansas potatoes should be washed, but many qualified their statements by adding that only potatoes of high quality should be washed and that they should then be dried and cooled to insure keeping. Washed potatoes of good quality on the Chicago market sold from 20 to 50 ct. per 100 lb. higher than unwashed potatoes of similar quality.

Retail trade practices and preferences for late-crop potatoes in Chicago and suburbs, and quality analyses of potatoes offered for sale to consumers, 1939-40, R. L. SPANGLER (*U. S. Dept. Agr., Agr. Market. Serv., 1940, pp. II+66*).—Over half of all retailers in the Chicago area sell not to exceed 10 sacks of 100 lb. per week, with about a fourth of the total handling only from 1 to 5 sacks. Most of the potatoes packed in consumer packages are distributed through corporate chain stores and prepared on order in the presence of the customer. Retailers expressed a decided preference for the red-skinned Colorado McClures and Nebraska Bliss Triumphs for general cooking purposes during the past season, while Idaho Russet Burbanks were an almost unanimous choice for baking potatoes. Varietal preference of retailers for potatoes was not generally expressed in terms of correct varietal names but in terms of State of origin or color of the skin. Round potatoes between 2.25 and 3.25 in. in diameter for general cooking purposes and Russet Burbanks for baking between 6 and 10 oz. in weight were reported to be most desirable. Cleaner potatoes, more uniform sizing, and better grading with more careful handling to eliminate a larger percentage of cut, bruised, and broken potatoes were advocated.

Potatoes in about 55 percent of the 100-lb. sacks examined in the retail stores met the requirements of U. S. No. 1 grade, and an additional 26 percent of the sacks contained from 88 percent to 93 percent of U. S. No. 1 quality potatoes. About 90 percent of the consumer packages examined were marked "U. S. No. 1," but only about 62 percent actually reached the stores with potatoes up to grade requirements although 84 percent contained potatoes that were 88 percent or more U. S. No. 1 quality.

Crops and Markets, [January-February 1942] (*U. S. Dept. Agr., Crops and Markets, 19* (1942), Nos. 1, pp. 24, figs. 3; 2, pp. 25-60, figs. 7).—Both numbers include crop, livestock, and market reports of the usual type. No. 1 includes annual tables for 1941. No. 2 includes a number of tables showing numbers, value, etc., of different kinds of livestock on farms in 1941 and makes comparison with 1940 and other years. It also contains an article on Cash Farm Income, 1938-41, which includes tables showing by calendar years the cash farm income in the United States by commodities and the income from crops, livestock and livestock products, and Government payments by States

RURAL SOCIOLOGY

[Studies in rural sociology by the Iowa Station] (*Iowa Sta. Rpt. 1941, pt. 1, pp. 233-235*).—Reports are presented on the following studies: Old-age assistance in Iowa, by R. E. Wakeley, in which suggestions are made that the most effective means of assisting old people are undertaken before people reach old age and that maintenance of health and interests outside the regular job are as necessary as the provision of food and shelter for the aged; factors determining the effectiveness of rural organizations in selected Iowa counties, and the social adjustment of members of the rural family, both by Wakeley and C. A. Anderson; and source of agricultural leadership in Adair County, by B. Ryan.

Economic and social aspects of soil conservation: A list of references, M. BENTON (*U. S. Dept. Agr., Soil Conserv. Serv., SOS Libr. List 2 (1941), pp. 25*).—All published references available through the Department Library are included.

Isolated settlement in Koochiching County, Minnesota, J. E. MASON (*U. S. Dept. Agr., Bur. Agr. Econ., 1940, LE-8, pp. [2]+49, pls. 8*)—Farmers and local officials in Koochiching County have recently come to recognize that high-cost isolated settlement is one of the most pressing problems facing them. Taxes are delinquent on many of the isolated holdings, and several isolated settlers are squatters on publicly owned land. The majority seemed to be content with their present residence but were willing to move to better locations. Relocation, aided and guided by public agencies, is deemed the principal instrument to solve or alleviate present problems of isolation, and rural zoning can be used to prevent the development of new instances of isolation.

New settlement problems in the northeastern Louisiana Delta, P. E. JONES, J. E. MASON, and J. T. ELVOVE. (Coop. U. S. D. A.). (*Louisiana Sta. Bul. 335 (1942), pp. 47, figs. 2*).—The purpose of the study was to appraise past settlement and agricultural development in an area where new settlement is proceeding at a relatively rapid rate and to determine the physical and economic feasibility of further development as a basis for recommending desirable public policy relating to such settlement and development. Topics discussed are the topography and drainage potentialities, soils, ownership and manner of land acquisition, internal farm organization, seasonal credit, difficulties encountered under the A. A. A. cotton program, social aspects of new ground settlement, public finance problems, and suggested programs and policies.

Poorly-housed rural families of two Pennsylvania townships, M. E. JOHN, D. S. HILLER, and D. L. BACKENSTOSE (*Pennsylvania Sta. Bul. 417 (1941), pp. [2]+26, figs. 4*).—This is a study of 232 low-income families living in shacklike dwellings in Greenfield and Snyder townships in Blair County, Pa. The purpose was to find out who they are, how they live, what is the extent of their adjustment, and what influence they have on the local area. Greenfield township was better suited to farming and slightly farther from a large town. A larger proportion of the shack-dwellers in this township came originally from that area and were more frequently employed in occupations related to farming than those of Snyder township. The group in Snyder township did less gardening than those in Greenfield township. They also were more frequently employed in factories. Only one Negro family and one foreign-born person were found in the entire group. High birth and mortality rates prevailed. The shacks were generally located on the poorer economic land classes. Little farming was done, but 72 percent of the families had vegetable gardens of some sort. Houses were small, producing crowded conditions. Forty-one percent

of the group lived in dwellings having less than one room per person. A majority of the families derived their incomes from private industry, agriculture, and Government aid, but had annual nonfarm incomes of less than \$600. Eighty-five percent of the real property owners on relief had received more relief in the period 1933 to 1940 than the market value of their property. Only a small percentage of these people had contact with any organization. As a group, they seemed to be well adjusted and generally satisfied with their surroundings. Their opinions were conservatively expressed and usually were more optimistic than pessimistic. The shack-dwellers exerted little, if any, influence on social and civic affairs of the local area, but a higher percentage of delinquent taxes was charged against them than against the rest of the people in Greenfield and Snyder townships.

The German-Swiss in Franklin County, Tennessee: A study of the significance of cultural considerations in farming enterprises. W. M. KOLLMORGEN (*U. S. Dept. Agr., Bur. Agr. Econ., 1940, LE-7, pp. [2]+II+113, figs. 3*).—The agricultural practices of the German-Swiss and of the control groups in Franklin County sustain the belief that cultural backgrounds are extremely significant in farming enterprises. In general, by following practices that build up and maintain soil fertility, the German-Swiss have shown themselves to be constructive farmers. Moreover, they have realized more adequately than the control groups the potentialities of the soil in a self-sustaining as well as in a commercial type of farming. They have demonstrated that a highly diversified form of agriculture is possible and relatively profitable on the red limestone soils of the near-South.

Religion and assimilation of the Dutch in Michigan. P. HONIGSHEIM. (*Mich. Expt. Sta.*). (*Mich. Hist. Mag., 26 (1942), No. 1, pp. 54-66; abs. in Michigan Sta. Quart. Bul., 24 (1942), No. 3, p. 256*).—The foreigner who observes life in the United States with the eyes of a comparative sociologist and historian is immediately surprised by two facts: The first, a lack of national minorities in the Old World sense, explained by the fact that these descendants of Old World peoples are more or less completely adjusted to the Anglo-American Protestant type of living, feeling, and thinking; and the second, the special kind of religious individualism that is found in this country. This appears in the number of denominations which, though they like to be independent of the State and value their individualism and singularity, yet are ready to work together in some spheres of life. Both facts are attributed to the predominance of the British type of Protestantism in the United States.

Attitudes of Edgefield County farmers toward farm practices and rural programs. M. T. MATTHEWS, D. R. JENKINS, and R. F. SLEETO. (*Coop. U. S. D. A.*). (*South Carolina Sta. Bul. 339 (1942), pp. 39, figs. 15*).—A sample of 164 farmers interviewed in Edgefield County gave from 31.3 to 93.9 percent support to 14 Government programs, while those disapproving ranged from 0.6 to 41.7 percent. Where the percentage of farmers approving is not high, a considerable proportion held neutral attitudes. Only two of the current Government programs were opposed by as many as a fifth of the sample farmers. One Government program, county agricultural planning, received support from only 37.4 percent, but the opposition consisted of only 10.4 percent of the operators. Restrictions on cotton production and the purchase of submarginal land for forests were disapproved more often than were other programs sponsored by the Federal Government, about one-fifth of the farmers expressing disapproval.

Rural youth in Massachusetts. G. MELDEUM and R. E. SHERBURNE (*Massachusetts Sta. Bul. 386 (1941), pp. 8, figs. 3*).—This study is based on a house-to-house survey of all boys and girls between the ages of 16 and 25 in selected

rural towns in four counties and interviews with boys enrolled in vocational agriculture and girls taking vocational agriculture and home economics.

More vocational training is wanted by these young people. Repercussions of the national defense program have shown vividly that this is more than a personal need. Adequate placement service is lacking for rural young people. The study has shown plainly the need for more adequate means of finding employment opportunities and allocating individuals to them. In getting jobs, the young people showed that they have had to be largely self-reliant. A young people's community placement bureau, even though difficult to set up, would have the advantage of providing the needed placement service and would also enable the youths to demonstrate their own importance.

Virginia rural youth talking and doing, W. E. GARNETT, M. MACD. WARD, and C. G. BURR. (Coop. U. S. D. A. et al.). (*Virginia Sta., Rural Sociol. Rpt.* 18 (1942), pp. [6]+42, figs. 11).—This outgrowth of study previously noted (E. S. R., 86, p. 699) is an elementary treatise for rural youth, dealing with growing up, becoming a worker, making a home, using leisure, and being a good citizen.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

[**Rural and home economics education studies by the Iowa Station, 1941**] (*Iowa Sta. Rpt. 1941, pt. 1, pp. 231-233*).—Studies are presented on the following subjects: Nature and extent of the need for education in agriculture for beginning farmers in Iowa, by B. Morgan and J. A. Starrak; factors determining the effectiveness of part-time education in agriculture, by Morgan, T. E. Sexauer, and J. B. McClelland; factors affecting the supply and demand of home economics teachers in Iowa, by H. Chadderdon; and development of scales to measure attitudes toward agricultural pursuits, by J. E. Wert.

Problems in training agricultural engineers, E. E. BRACKETT. (Univ. Nebr.). (*Agr. Engin.*, 22 (1941), No. 7, pp. 245-246, 248).—The author discusses various aspects of the relations between teaching staff and engineering student and the prospective commercial employer.

Some landmarks in the history of the Department of Agriculture, T. S. HARDING (*U. S. Dept. Agr., Agr. Hist. Ser. No. 2* (1942), pp. [6]+94).—This study was gleaned from the official annual reports relating to agriculture, from the beginnings in the Patent Office to date. The annual reports of the Patent Office starting with 1837 and extending through 1861, the reports of the Commissioner of Agriculture beginning with 1862, and finally the reports of the Secretary of Agriculture from 1889 have been searched for data as to significant developments.

The Iowa farm service guide: Governmental agricultural services—National, State, local, J. A. VIEG (*Iowa Sta. Bul. P34, n. ser.* (1941), pp. 125-188).—It is the purpose of this guide to list and describe the services Iowa farmers may obtain directly from their National, State, and local governments.

FOODS—HUMAN NUTRITION

[**Foods and nutrition studies by the Maine Station**] (*Maine Sta. Bul.* 405 (1941), pp. 431-456).—These progress reports (E. S. R., 85, p. 691) summarize findings obtained by M. M. Clayton in a study of the nutritional status of University of Maine freshman girls as related to their diet and in the continuance of a study of the food habits and nutritional status of children in selected communities in Maine; by E. F. Murphy in an investigation of the

regional and varietal differences in vitamin C content of food crops in relation to vitamin C status; and by W. F. Dove in a study of the relation of man and of animals to the environment.

[**Studies in foods and nutrition by the Iowa Station**] (*Iowa Sta. Rpt. 1941, pts. 1, pp. 22-27, 99-100, 176-182; 2, p. 64*).—Progress reports of the work of the year, some of which was in continuance of studies noted previously (E. S. R., 85, p. 268), cover research by H. H. Plagge, F. J. Beard, and G. F. Stewart on foods frozen and stored in refrigerated locker plants, freezing and storage of meats and poultry, and the refrigerated locker storage of fruits and vegetables (pp. 22-27); an investigation by J. A. Schulz, C. C. Culbertson, M. D. Helser, and Beard of the adaptability of the rat for studies of the chemical relationships between food ingested and the softness of body fat (pp. 99-100); research by P. P. Swanson on growth, reproduction, lactation, longevity, and hemoglobin formation in albino rats on meat diets, on the Steenbock diet, and on the Sherman milk diet, and on conditions influencing the production of uniform experimental animals in the stock colony (pp. 176-177); studies by Swanson and P. M. Nelson on the biological value of autoclaved pork muscle, on dietary factors in the production and cure of toxemic pregnancies induced by the feeding of certain pork diets (p. 177), on modifications in blood, urine, and tissues of rats affected with pregnancy disorder induced by feeding diets containing pork, and on dietary factors related to the incidence of gastric ulcers in the rat (pp. 181-182); certain phases of the cooperative project on the nutritional status of college women as related to their dietary habits, by Nelson and M. Ohlson (pp. 178-179); palatability studies of poultry, by B. Lowe and Stewart (pp. 179-180); and a study of the protein and vitamin values of various portions of corn, by Schulz, B. H. Thomas, and R. M. Hixon (p. 64).

Nutritive studies of rice and its by-products, M. C. Kik (*Arkansas Sta. Bul. 416 (1942), pp. 28, figs. 3*).—Preliminary biological analyses were planned to reveal any deficiencies in the nutritive value of whole brown rice, polished rice, rice bran, and rice polish. In these tests experimental animals (albino rats) were first fed the foodstuffs alone, following which progressive additions of minerals, proteins, and vitamins were made until the diet was able to maintain the rats in a healthy nutritional condition, as judged by growth, reproduction, and physical appearance. From these tests "it is concluded that in order to promote good growth polished rice needs fortification with vitamins A and D, minerals, protein, and the vitamin B complex, and whole rice needs supplementation with vitamins A and D, minerals, and protein. Rice polish and rice bran need additions of vitamins A and D and minerals in order to promote good growth. Since animals on rice-bran and rice-polish rations had continuous fertilities, it is evident that these byproducts of rice furnished an adequacy of vitamin E."

In growth experiments in which the various rice products were fed at a protein level of 5.5 percent, it was found that the average gain in weight per gram of protein intake was 1.80 gm. for animals fed the whole-rice ration and 1.66 gm. for those fed the polished-rice ration. These differences in growth-promoting values were explained by the differences in digestibility coefficients and biological values of the proteins. Although the whole rice had a lower digestibility than polished rice (96.5 against 98.0 percent), the biological value of the latter (66.6 percent) was lower than that of the former (72.7 percent), resulting in a better utilization of the whole-rice protein (at a 5-percent level). In a comparison of rice polish and rice bran fed at a protein level of 8 percent, the rice-polish protein was found to have a digestibility of 88.7 percent and a biological value of 78.9 percent and to produce a weight gain of 1.79 gm. per

gram of protein consumption, while rice-bran proteins with a lower digestibility (83.0 percent) and biological value (71.9 percent) produced a weight gain of only 1.48 gm. per gram of protein. The proteins of rice bran and rice polish were somewhat less digestible than those of whole rice and polished rice but were of higher biological value. Previously reported studies (E. S. R., 88, p. 415) on the amino acid content of the rice proteins and on the supplemental value of amino acids on the growth-promoting value of these proteins are summarized.

Edible soybeans. E. A. CURREY (*Miss. Farm Res. [Mississippi Sta.], 5 (1942), No. 3, p. 8*).—Different varieties of edible soybeans grown and tested at the Delta Substation for the past 10 yr. have yielded many desirable plant selections and hybrids. The early-maturing varieties seem more promising than the late-maturing varieties. The performance of 15 of the varieties and strains in the test for as long as 7 yr. is reported. Color, harvest date, yield (7-yr. average in bushels per acre), flavor, and oil content are recorded.

The effects of additions of dried skim milk and dried whey on the baking quality and nutritive properties of white bread. K. M. HENRY, J. HOUSTON, S. K. KON, J. POWELL, R. H. CARTER, and P. HALTON (*Jour. Dairy Res. [London], 12 (1941), No. 2, pp. 184-212, figs. 3*).—The breads were made by a short straight dough process, using 2 percent yeast, $1\frac{1}{4}$ percent salt, and a total fermentation time of $3\frac{1}{4}$ hr. The quantity of water used in mixing the doughs was adjusted on the basis of preliminary trials which showed the addition of milk powder (a commercial roller-dried product) to increase the absorption of the mixture, while the addition of whey powder (also roller-dried) lowered the absorption. Additions of 2 percent of the dried milk had no marked effect on loaf quality or flavor, while 4 percent or more produced a loaf with smaller volume, a more rubbery crumb, and a flavor departing from the normal neutral flavor of water bread. The dried whey up to 5 percent caused no marked deterioration of the crumb, although with one flour this quantity decreased the volume by 16 percent. At this level the whey imparted a distinct cheesy flavor to the bread. The addition of 2 percent milk solids doubled, 6 percent whey trebled, and 6 percent milk quadrupled the calcium content of white bread. In the 6 percent milk or whey loaves vitamin B₁ and riboflavin, both determined fluorimetrically, amounted, respectively, to 1.3 μ g and 88-100 μ g. per gram of dry matter as compared with corresponding values of 1.0 and 36 μ g. in white bread.

Beneficial effects of the milk or whey additions, shown in tests with rats fed the breads as exclusive diets, were attributed not only to the increase in calcium but to a large extent to the vitamin increase. Retention of bread calcium, amounting to 60 percent in rats fed white breads, was increased by the addition of dried skim milk or dried whey to the bread. The added calcium was almost completely retained. Determinations by the Mitchell method of the biological value and the true digestibility of the proteins (fed at an 8.5-percent level) of white bread, 2 percent milk bread, and 6 percent milk bread gave the following respective values: 44.7 and 90.9, 47.6 and 89.6, and 49.7 and 88.9. A separate comparison of white bread, 2 percent whey bread, and 6 percent whey bread yielded similarly 47.4 and 92.9, 45.9 and 91.1, and 47.4 and 88.9. At most, 15 percent of the bread proteins were derived from milk and no supplementary relation was detected at such low levels.

Water tolerance of new shortenings makes sweeter cakes possible at higher altitudes. W. E. PYKE and G. JOHNSON (*Colo. Farm Bul. [Colorado Sta.], 4 (1942), No. 1, pp. 5-9, figs. 2*).—The formulas for normal-, intermediate-, and high-sugar-ratio whole-egg cakes, normal- and high-sugar-ratio white cakes,

and gold cakes, and directions for mixing are based on experimental work previously reported (E. S. R., 84, p. 414). It is pointed out that the amount of leavening agent used should be decreased as the altitude increases, but that it is not necessary to decrease the ratio of shortening and sugar to the cake flour used provided the available liquid is increased in the proper proportions as the altitude increases. At high altitudes (above 8,000 ft.) neither butter nor lard can successfully tolerate the increased volume of liquid required for normal- and high-sugar-ratio cakes, but hydrogenated cake shortenings are satisfactory, giving batters which do not curdle if the recommended mixing procedure is employed. For the high-sugar-ratio white cakes it is even necessary to use a special high-water-tolerant shortening of a type now available in large containers, although not yet distributed in small containers for household use.

Bactericidal effect of ultraviolet rays on microorganisms on restaurant glass-ware, J. W. APPLING and F. W. TANNER. (Univ. Ill.). (*Soc. Expt. Biol. and Med. Proc.*, 47 (1941), No. 1, pp. 51-54).—A sampling procedure designed to examine the entire inner surface of drinking glasses, as well as the rims, is described as follows:

"About 5 cc. of a 25-cc. water blank were poured into the drinking glass to be sampled and the entire inner surface of the glass was wetted and rubbed by means of a sterile cotton swab. The swab was then broken off into the rest of the 25-cc. water blank and shaken vigorously until the cotton had become well disentangled. The cotton swab and the remainder of the water blank were then carefully transferred back to the drinking glass. The contents of the glass were mixed by a few rapid rotations and 1-cc. portions were plated on agar." This method proved quite satisfactory and was used in this investigation, in which the Sterile-Ray Cabinet employing four Sterilamps was tested while in actual operation at a soda fountain. Dry, clean glasses of low bacterial count showed but slight bacteriological improvement, while wet, clean glasses showed marked improvement upon such exposure, although complete sterilization did not result in every case. The experimental evidence obtained indicated that almost sterile surfaces were produced when clean drinking glasses were irradiated by ultraviolet light produced by the Sterilamp.

Food preservation in wartime poses many problems, D. K. TRESSLER (*Farm Res. [New York State Sta.]*, 8 (1942), No. 2, pp. 15, 19, 20, fig. 1).—A shortage of tin has imposed major readjustments in the canning industry and given impetus to freezing preservation and to development of better methods of drying fruits and vegetables. The need for the concentrated dried food is further intensified by the shortage of shipping space. It is noted that Cornell University, in collaboration with the U. S. D. A. Bureau of Home Economics and the Universities of Texas and California, is cooperating in studies of (1) vitamin losses during drying of vegetables, (2) the losses of vitamins which may occur during storage of dried vegetables, and (3) the amount of scalding of the raw product required to insure maximum retention of the vitamins. It is also planned to test freshly harvested vegetables for varietal adaptability to dehydration.

Preserving foods in frozen food lockers, G. A. FILINGER and D. L. MACKINTOSH (*Kansas Sta. Cir.* 209 (1941), pp. 29, figs. 12).—The suggestions offered in this circular are based on trade practices and on research conducted at this and other stations. General directions for preserving fruits and vegetables concern preparation, packing, and containers. Special considerations with regard to individual products include suggestions as to suitable varieties. A separate section on preserving meats in frozen food lockers deals with slaughtering, packaging, wrappers, freezing, and the cooking of the frozen cuts, and suggests appropriate

seasons and live weights at which to slaughter. The appendix includes a timetable for cooking thawed and unthawed cuts; suggestions regarding the use of frozen food lockers; charts showing wholesale and retail cuts of beef, pork, veal, and lamb; and the recommended sanitary regulations of the Kansas State Board of Health.

Report of a study on the toxicity of several food preserving agents, K. E. HARSHBARGER. (Univ. Ill.). (*Jour. Dairy Sci.*, 25 (1942), No. 2, pp. 169-174).—A series of paired feeding experiments with white rats was conducted, in which the basal diet consisted of a commercial fox food plus 5 percent of yeast, 2 of cod-liver oil, and 0.5 percent of salt. The food-preserving substances tested included additions to the diet of 1 and 3 percent each of calcium propionate, sodium propionate, and sodium benzoate; 3 percent of zephiran; and 3 percent of a 1:1 mixture of glycine and sodium benzoate. In all cases calcium lactate was added to the control diet at the same level that the preservative substance was added to the experimental diet. Experimental feeding periods ranged from 2 to 5 weeks.

Neither the calcium propionate nor the sodium propionate at the 1- or 3-percent level decreased the gain in weight. The addition of zephiran caused no ill effects and, in fact, exerted a slight growth-stimulating effect. Sodium benzoate at the 1-percent level did not affect gain, but at 3 percent definite toxic effects were observed. The addition of glycine to the sodium benzoate diet tended to alleviate the toxicity. Evidence is presented that the animal organism may develop a tolerance for sodium benzoate. The desirability of utilizing the paired feeding method for such studies is discussed.

Nutrition in health and disease, L. F. COOPER, E. M. BARBER, and H. S. MITCHELL (Philadelphia and London: J. B. Lippincott Co., [1941], 8. ed., rev., pp. XVI+709, pls. [3], figs. 100).—This is a revision of an earlier noted volume (E. S. R., 66, p. 890).

Selecting foods to meet body needs, W. E. KRAUSS (*Ohio Sta. Bimo. Bul.* 214 (1942), pp. 3-9).—This popular presentation indicates the daily human requirements in terms of specific nutrients and discusses how these may be met by wise choice of foods. The suggestions discussed are summarized in a daily food guide presented as a chart.

School lunches in country and city (U. S. Dept. Agr., Farmers' Bul. 1899 (1942), pp. [2]+27, figs. 14).—This publication, prepared by C. B. Sherman from an economic study by Southworth and Klayman (E. S. R., 86, p. 555), "tells how the school lunch program works, how rural schools enter the program, and how they can get help to keep the lunches going. It shows that the background and basis of the school lunch undertakings are usually somewhat similar in city, village, and country."

A rural school experiments with noon lunches, A. M. MOSER. [S. C. Expt. Sta.] (*Jour. Home Econ.*, 34 (1942), No. 1, pp. 22-24).—As the result of experience in planning lunches for a rural elementary school in South Carolina, using available surplus commodities and canned and dried fruits from a W. P. A. school garden and canning project, the author raises certain questions needing consideration if maximum results in improved child health are to be secured from such school lunch programs. These concern the best hour for the lunch with reference to the schedule of home meals, the planning of the lunch at different seasons to supplement the home diets, the importance of correcting physical defects, when found, in order to reap the full benefit of the improved diet, the difficulty in securing correction of defects revealed by health examinations, and the significance of coordinating nutrition teaching with the school lunch.

Food consumption in German worker families, J. H. RICHTER (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr.*, 6 (1942), No. 2, pp. 77-82).—A tabulation gives consumption data and a calculation of the energy values of the most important items in the diet of German worker families based on a comprehensive survey of family budgets of 896 worker families (1927-28); an inquiry conducted by the German Labor Front (1937), the worker families concerned being at a lower economic level than those in the earlier survey; and estimates based on rationed consumption as per official rations and estimated unrationed consumption (1939-41). A comparison of these consumption data shows that "the fuel value of per capita food consumption in the worker families polled in 1937 was 5 percent below that of the consumption in the families polled in 1927-28, whose average real income was about 25 percent higher. . . . Wartime consumption of foodstuffs by worker families in 1939-41, as far as can be ascertained, may have amounted to from 90 to 100 percent of the calorie values consumed in 1927-28 and to from 95 to 105 percent of the calorie values consumed in the 1937 worker families at the lower economic level. It should be noted, however, that the wartime diet's proportions of fats and animal proteins and of food vitamins and mineral salts are generally reduced. For the average of the civilian population the reduction in fats and animal proteins may have been as much as 25 percent compared with pre-war, and of all proteins about 15 percent. These reductions, while still greater for so-called normal consumers, were less extensive for worker families than for the average of the whole civilian population."

The influence of a tropical environment upon the basal metabolism, pulse rate, and blood pressure in Europeans, R. G. S. MACGREGOR and G. L. LOH (*Jour. Physiol.*, 99 (1941), No. 4, pp. 496-509).—This paper records observations of basal metabolic rate, determined with a Benedict recording spirometer, and blood pressure carried out on Europeans resident in Singapore for varying periods. The subjects, normal individuals, were soldiers residing in barracks. One group of 35 included those examined at the end of 2 and of 6 months' residence (and again after 8 and 12 months' residence, respectively), and another group of 35 included subjects examined at the end of 2½ years' residence. In certain of the individuals, but not in others, there was a definite reaction to tropical environment, this reaction consisting of a gradual fall in the basal metabolic rate and a corresponding variation in pulse rate and systolic and diastolic pressure in certain cases. The depression in metabolism in the subjects thus affected seemed to reach a maximum before the end of the first year in the Tropics, the lower value being maintained after 2 yr. The environmental factors of possible influence are discussed, it being concluded that climatic rather than dietetic or occupational influences were responsible for the variation.

Basal metabolism and heat loss of young women at temperatures from 22° C. to 35° C.: Clinical calorimetry No. 54, J. D. HARDY, A. T. MILHOBAT, and E. F. DU BOIS. (Cornell Univ. et al.). (*Jour. Nutr.*, 21 (1941), No. 4, pp. 383-404, figs. 5).—In this complete report of an investigation noted from a preliminary report (*E. S. R.*, 81, p. 872), the observations have been extended to a total of eight women subjects, and the results compared with those obtained in similar studies on two male subjects (*E. S. R.*, 80, p. 558).

The basal metabolic rate of the women in the colder zone, about 35 calories per square meter per hour, was approximately the same as that of the men. In the warmer zone the women showed a drop in basal metabolism to an average of 30.9 calories per square meter per hour at 31°, but the men no such drop. In the women this fall in basal metabolism was accompanied by marked decreases in the heat loss, reaching at 31.5° a level of 28.5 calories

per square meter per hour, while the lowest point observed for the men was 34.9 calories. The average skin temperature for the women in the hot zone was higher than that of the men by about 1.5°, and in the cold zone lower by 1.0°. The conductance of the peripheral tissues of the women in the cold experiments was 20 percent lower than that of the men. Sweating was less marked in the women and did not begin until a much higher temperature than the men. "In general, there were slight differences in every single factor of temperature regulation, and in all respects the women had physiological advantage, but especially in the reduction in heat loss and heat production in the warmer comfort zone." The authors had the technical assistance of G. F. Soderstrom.

Depletion of tissue glycogen during fasting and fatigue and partial recovery without food, P. E. NUTTER (*Jour. Nutr.*, 21 (1941), No. 5, pp. 477-488).—This study, conducted for the purpose of securing base-line values from which to calculate recovery of glycogen following fatigue and feeding with known amounts of glucose and fructose, was concerned, first, with the effect of various factors upon glycogen recovery. Young albino rats falling within a restricted weight range (about 140-150 gm.), nearly all of the female sex, and previously maintained on a uniform diet (Purina Dog Chow), were employed. Preliminary studies on the glycogen content of paired muscles showed that values agreed much more closely when these tissues were removed from living animals anesthetized with amytal than when taken from those killed by a blow on the head. The latter method was frequently accompanied by convulsive movements with consequent glycogenolysis in the muscles proceeding further in the last muscle of the pair to be removed. Of the various methods for fatiguing rats—running ad libitum in revolving cages, forced running on a treadmill, and swimming in water at different temperatures—swimming in water at 30° C. (86° F.) was found most satisfactory.

The 16 normal, fed rats showed an average liver glycogen content of 2,779 mg. percent and a muscle glycogen of 572 mg. percent. After 24 hours' fasting, the liver glycogen was reduced to a very low level (34 mg. percent), while muscle glycogen was reduced by about one-third (to 380 mg. percent); after 24 hr. the rate of fall of muscle glycogen was much slower. Fatiguing swimming for 8 hr. while fasting had little further effect on liver glycogen, which was reduced to 21.5 mg. percent, but decreased the muscle glycogen to a much lower level (71 mg. percent). During the recovery period after fatigue by swimming, a small amount of glycogenolysis occurred, notwithstanding the fasting state. Liver glycogen was not much affected until the third hour, when it reached a level of 69 mg. percent. Muscle glycogen rose steadily in the first 2 hr. (to 120 mg. percent), but only slightly in the third hour (to 122 mg. percent).

Glycogen formation in liver and muscle from glucose and fructose after extreme muscular exhaustion, P. E. NUTTER and J. R. MUEHLIN (*Jour. Nutr.*, 21 (1941), No. 5, pp. 489-502, figs. 3).—In continuance of the study noted above, rats fasted and fatigued by swimming were fed glucose or fructose solutions by stomach tube, and after 1-, 2-, and 3-hr. absorption periods anesthetized with amytal for removal of liver and muscles and collection of unabsorbed residues from the gastrointestinal tract. The amount of sugar absorbed and of new glycogen formed over and above the control level in liver and muscle, as established in the preliminary study, were determined. Fructose was absorbed at a slower rate than glucose, but both sugars showed a falling off in absorption rate as the time was prolonged.

Values are reported for new glycogen in liver and muscle 1, 2, and 3 hr. following administration of each of the sugars. To allow for differences in absorption rates, values are also reported for the percentage of absorbed sugar converted to glycogen and for the "index of glycogen formation." This index, calculated as the ratio of new glycogen (expressed as milligrams of glucose per 100 gm. of tissue) to sugar absorbed (milligrams per 100 gm. body weight) takes into account both absorption rates and glycogenesis rates. The results, analyzed for statistical significance, showed that glucose was superior to fructose in rebuilding liver glycogen stores during the first hour of recovery after exhausting fatigue. Fructose approached glucose in activity in the liver in the second hour, and in the third hour was much more effective than glucose. In muscle the average results for new glycogen formation indicated a greater effectiveness for glucose, especially in the first 2 hr., but the difference between the two sugars was not statistically significant at any time.

The rate of absorption of various fatty acids by the rat, H. J. DEUEL, JR., L. HALLMAN, and A. REIFMAN (*Jour. Nutr.*, 21 (1941), No. 4, pp. 373-382).—Divergent absorption rates of the various synthetic triglycerides were observed in an earlier study (*E. S. R.*, 85, p. 560). To determine whether the variations were due to differences in the speed with which the liberated fatty acids left the gut, tests were made by the methods previously used of the rate of absorption by the fasting rat of the fatty acids from acetic to tridecyllic. The distillable fatty acids (acetic to heptylic) were fed as the sodium salts in doses equivalent to 100 mg. of acid per 100 cm.² of body surface, while the higher homologs were administered as the free acids at a level of 200 mg. per 100 cm.² Butyric, caproic, and caprylic acids were absorbed most rapidly, nonyllic acid at an intermediate rate, and propionic, valeric, and heptolic acids more slowly than any of these. The results suggested that the discrepancy noted earlier in the rate of absorption of the triglycerides of even- and odd-chain fatty acids may have been due to differences in removal of the component fatty acids from the gut. Sodium acetate was absorbed faster than the sodium propionate, but not as fast as might have been expected from the earlier results on triacetin. Capric, undecylic, and tridecyllic acids, absorbed at approximately 20 mg. per 100 cm.² per hour, disappeared at a rate considerably below that for caprylic acid and somewhat below that of nonyllic acid, as determined in experiments of 1 and 2 hours' duration. Lauric acid was absorbed very slowly, less than 5 percent of that administered leaving the gastrointestinal tract over a 3-hr. period. The slow rate of absorption may have been related to the fact that the lauric acid solidified in the stomach, although trilaurin with a higher melting point was shown in earlier tests to be absorbed much more rapidly.

A simplified determination of blood prothrombin levels in the newborn, C. P. HUBER and J. C. SHRADEE (*Jour. Lab. and Clin. Med.*, 26 (1941), No. 8, p. 1379-1382, figs. 4).—The method described represents not an accurate determination of prothrombin level but a measure of clotting activity. Twenty mm.³ of blood obtained from the infant by heel puncture are immediately transferred from the blood pipette to 20 mm.³ of thromboplastin extract on a clean glass slide. The stop watch is started, the blood and the solution are mixed, and the drop is pricked every second with a stylus until a firm fibrin strand adheres to the point. The interval in seconds, recorded as the prothrombin time, is calculated to percentage of normal as determined by using adult finger blood. The thromboplastin extract is prepared as a normal saline extract of fresh sheep or swine lung. After straining through a double layer of broadcloth, the extract is put in frozen storage, where it retains its potency for at least 6 weeks, and is thawed at room temperature at the time of use.

With this procedure applied routinely to 114 infants, a decrease in clotting activity was demonstrated, the maximum decrease being reached on the second and third days of the neonatal period. Normal infants showed a return to normal clotting activity by the beginning of the second week of life. There was indication of a seasonal variation in prothrombin deficiency, this appearing most marked during the early spring.

Use of sulfaguanidine in nutrition experiments, S. BLACK, J. M. McKIBBIN, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 47 (1941), No. 2, pp. 308-310).—Young rats placed at weaning on a purified basal ration of sucrose, casein, salts, corn oil, and the B vitamins choline hydrochloride, nicotinic acid, calcium pantothenate, thiamin, pyridoxin, and riboflavin in appropriate amounts with 2 drops of halibut-liver oil containing 1 mg. of *dl*- α -tocopherol acetate per rat weekly grew at a rate of 28.9 gm. weekly. Others on the same diet supplemented with 0.5 percent of the antibacterial agent sulfaguanidine gained an average of only 9.3 gm. per week, with a further supplement of 0.3 gm. liver extract 32.1, and with no liver extract but 3.0 mg. *p*-amino benzoic acid 18.2 gm. weekly. A possible explanation advanced for these differences is that the reduced growth on the basal diet plus 0.5 percent sulfaguanidine may be due either to the inhibition of intestinal synthesis of essential growth factors which liver extract supplies or to a toxicity which is counteracted by a factor in the liver extract. Evidence is given in favor of the first of these assumptions.

Comparison of effects of large doses of various activated sterols on serum calcium, E. W. McCHESNEY and H. KOCHER (*Soc. Expt. Biol. and Med. Proc.*, 47 (1941), No. 1, pp. 156-159, figs. 2).—Vitamins D₂ and D₃ and "Ertrion," a form of activated ergosterol claimed by its manufacturers not to have the hypercalcemic or other toxic effects of calciferol, were administered, first in doses of 25,000 International Units and in later tests at levels of 100,000 I. U. to adult albino rats. A. T. 10 (dihydrotachysterol) was administered at two levels represented by 0.5 cc. of 0.5 and 1.0 percent solutions, respectively. Groups of animals were sacrificed at intervals as long as a significant hypercalcemia persisted. The findings with regard to serum calcium indicated that crystalline vitamin D₂ and Ertrion were statistically indistinguishable in their effects, that vitamin D₃ produced a more prolonged hypercalcemia than did vitamin D₂, and that the effects of the larger dosage of A. T. 10 very closely resembled those of the 100,000 I. U. dosage of vitamin D₂. This response to A. T. 10 was far greater than would have been predicted from its antirachitic value.

Some effects of iron on hemoglobin formation, W. M. FOWLER and A. P. BAPER (*Amer. Jour. Med. Sci.*, 201 (1941), No. 5, pp. 642-651, figs. 7).—Hemoglobin response was followed over a period of 26 weeks in four groups of patients receiving iron and ammonium citrates or reduced iron in dosages of 1 gm. per day. In the first two groups medication with these two compounds, respectively, was discontinued after 60 days, while in the last two medication was continuous throughout the period of observation. The range in hemoglobin in the various members of these four groups was from 8.45 to 14.38 gm. per 100 cc. (Newcomer method), the averages for the respective groups being 10.32, 10.17, 11.53, and 11.36 gm. per 100 cc. The response in all groups was similar, however, regardless of the iron compound used and regardless of whether or not the iron medication was given for a period of 60 days or continuously throughout the period of observation. This response, as indicated by the data and curves presented, consisted in an increase in blood hemoglobin which reached a peak at the end of from 10 to 12 weeks, following which there was a reduction in hemoglobin either to the pretreatment level, or somewhat above

this level. No prediction could be made from the original hemoglobin value as to the final level. The authors are inclined to classify as cases of mild anemia those showing persistent elevation above the pretreatment level (but below the maximum response), and as low normal cases those showing a fall to the pretreatment level. "This interpretation presupposes that each individual has a hemoglobin level which is normal for him or herself, but that this normal varies from one individual to another so that a reading which is normal for one individual may represent a mild degree of anemia in another." The subjects with slightly high hemoglobin values (13.33–15.74) given continuous iron medication showed a response similar to that of the other groups but less marked. These results are interpreted to suggest a stimulating action of iron on hemoglobin formation in addition to its action as replacement therapy.

Child health and the Selective Service physical standards, A. Crocco, H. KLEIN, and C. E. PALMER (*Pub. Health Rpts. [U. S.], 56 (1941), No. 50, pp. 2365–2375*).—From a comparison of the names of 697 selectees examined by physicians of two Draft Boards in Hagerstown, Md., and of school children from the same communities given a physical examination during the period of 1922–28, 411 were found to have had both examinations. Of these, 225 had been rejected by the Draft Board because of some physical defect. Of these, 62 had been rejected because of dental caries, 23 chiefly for defective vision, 27 for some impairment of the cardiovascular system, 15 for defects of the ear, and 7 for defective lungs, including tuberculosis. At the earlier school examination, the number of decayed, missing, or filled permanent teeth per 100 children was twice as high among those later rejected by the Draft Board physicians as among those placed in class I–A. The Snellen test for visual acuity showed that 70 percent of the children later to be placed in class I–A had a visual acuity of 10/10 for the right eye, 69 percent for the left, and 65 for both eyes, while the corresponding percentages among those later rejected for defective vision were 27, 33, and 18. The data relative to cardiovascular diseases and ear defects were suggestive but not conclusive, and the earlier tests did not include lung examinations.

"If it be true, as few will deny, that the need for competent, healthy, physically fit young men is now and will be, for some years, at an all-time high, then this need must be explicitly recognized and satisfied. Satisfaction of this need involves acquiring information on all significant early (and especially remediable) defects, employing accurate measures of functional status, recording the pertinent information in objective and permanent form so as to serve as both a medical history and a basis for the evaluation of therapeutics, and finally, it involves the necessary corrective work. In these ways it would seem possible to attain not only effective prevention of damage from disease but also effective upbuilding of national physical status."

Effect of pregnancy on the phosphorus turn-over of the skeleton of rats maintained on normal and rachitogenic diets, M. L. MANLY and S. R. LEVY (*Jour. Biol. Chem., 139 (1941), No. 1, pp. 35–41, Figs. 2*).—Radioactive phosphorus was administered by stomach tube in a single dose to each of 40 female rats. Certain of these animals were mated 2 or 7 days subsequent to the dosage and maintained during pregnancy on normal or rachitogenic diets. Nonpregnant controls were likewise maintained on these two diets. The animals were sacrificed when the litters were cast, and whole bones of the young and blood, bones, and teeth of the adults were analyzed to determine the distribution of the radioactive phosphorus. These analyses showed that pregnancy, either with the normal or the deficient diet, had no significant effect on the distribution of the marked phosphorus in the maternal skeleton, molars and diaphyses, considered in particular, containing practically the same proportion of marked phosphorus in the

case of the mothers as in the case of the controls. The rachitogenic diet (Steenbock and Black) caused an increase in the radioactive phosphorus fractions of total phosphorus in the actively calcifying tissues of the young.

Specific nutritional deficiency disease, R. L. HADEN (*Jour. Amer. Dent. Assoc.*, 28 (1941), No. 5, pp. 726-731; also in *Med. Woman's Jour.*, 48 (1941), No. 7, pp. 210-214, XI).—The term "specific nutritional deficiency disease" is defined as the condition which "results from a lack of one or more of the essential nutritional factors," these including calcium, phosphorus, iodine, iron, the various known vitamins, and the erythrocyte-maturing factor. Tables are included on the specific function of these factors, the systems involved and lesions observed in deficiency disease in adults, clinical conditions associated with specific nutritional deficiency disease, clinical signs and symptoms suggestive of deficiency disease, and factors in the supply, absorption, and utilization of specific nutritional elements. A few case reports showing different phases of vitamin B (complex) deficiency are given to illustrate some of the clinical problems involved.

Round table discussion on vitamins from the standpoint of the practicing pediatrician, F. F. TISDALE ET AL. (*Jour. Ped.*, 18 (1941), No. 5, pp. 670-690).—In this round table, held at the tenth annual meeting of the American Academy of Pediatrics, the topics discussed and the leaders were Vitamin C, by O. A. Bessey; Vitamin D, by D. J. McCune; Vitamin K, by T. G. H. Drake; and the B Vitamins, by W. H. Sebrell.

Considerations in the selection and use of values expressing the vitamin content of foods, H. E. MUNSELL (*Jour. Amer. Dietet. Assoc.*, 17 (1941), No. 4, pp. 311-320).—This review, discussing some of the problems that must be dealt with in the selection of values expressing the vitamin content of foods, considers methods of assay, both biological and chemical or physical; natural variation in the vitamin content of foods; and loss of vitamin value in "fresh" foods. The practical application of these considerations is discussed briefly.

Vitamin blockade, W. H. MANWARING (*Calif. and West Med.*, 55 (1941), No. 3, pp. 118-119).—Editorial comment, with references to the literature, on the explanation of the toxicity of raw egg white as being due to its action as an avidalbumin uniting with biotin and thus producing a biotin avitaminosis.

The carotenoid and provitamin A content of the watermelon, L. ZECHMEISTER and A. POLGÁN (*Jour. Biol. Chem.*, 139 (1941), No. 1, pp. 193-198).—The carotenoids of the pulp of California-grown watermelon were analyzed chromatographically by procedures outlined in detail. One kg. of the pulp was found to contain "0.1 mg. of a complicated xanthophyll mixture, 6.1 mg. of lycopene, 0.06 mg. of γ -carotene, 0.16 mg. of unknown carotenoids (located in the column between γ - and β -carotene), 0.46 mg. of β -carotene, 0.01 mg. of α -carotene. The figures include the fractions of lycopene, and γ - and β -carotene which underwent isomerization during the experimental procedure." It is pointed out that the provitamin A content, about 0.5 mg. of β -carotene per kilogram of pulp, is of the order of magnitude found by Munsell (*E. S. R.*, 64, p. 586) in feeding experiments with rats.

Studies in vitamin A: Relation of blood level and adaptation to dim light to diet, H. W. JOSEPHS, M. BABER, and H. CONN (*Bul. Johns Hopkins Hosp.*, 68 (1941), No. 5, pp. 375-387, figs. 4).—A study of the content of vitamin A, carotene, and total lipides of the blood serum and of the adaptation to dim light of a large number of children visiting a pediatric clinic for physical examination for placement in homes, because of tuberculosis contact, or at the request of social agencies is reported with relation to the economic status and general dietary habits of the subjects. The methods used in the blood tests were those described in an earlier paper (*E. S. R.*, 63, p. 564). Measurements of light adapta-

tion were made with a simplified instrument suitable for use with children and described briefly in an appendix. For purposes of analysis the cases were divided into four groups of decreasing economic status and evidence of decreasing attention to the nutrition of the child.

The data showed a wide spread of values for serum vitamin A in all of the groups. With increasingly poor diets there was a downward shift in the carotene values, but only in the poorest dietary group was there a consistent decrease in the vitamin A values and a shift in the adaptation time. The authors are of the opinion, on the basis of the cases studied, that "the blood level has the same significance as the adaptation test in regard to its use in diagnosis and the same limitations. In the case of each procedure we can obtain presumptive evidence of relatively severe deficiency in the absence of anatomical evidence, but we cannot yet by these means diagnose the mild deficiency or say in any given case that the vitamin A of the diet is insufficient for the child's needs unless it is grossly deficient."

Biophotometric measurements of dark adaptation among roentgenologists: A measure of vitamin A deficiency, H. H. LERNER (*Amer. Jour. Roentgenol. and Radium Ther.*, 45 (1941), No. 5, pp. 753-755, figs. 6).—The biophotometer test, following the technic of Jeans et al. (*E. S. R.*, 77, p. 886), was given to 16 roentgenologists associated with different hospitals in Boston. Normal curves were obtained for 12 of the subjects and subnormal ones, with a drop below 0.6 millifootcandle and a delayed rise to the base line, in the other 4. Of this group, 2 had had considerable difficulty in night driving, a third had been conscious of a longer time than his associates to accommodate to darkness, and the fourth had experienced difficulty in finding a seat in a darkened theatre. These 4 subjects were put on a high vitamin A diet plus carotene (30,000 units daily), following which normal biophotometer readings were obtained in 3 weeks. On the basis of these findings and the extensive work of others, it is suggested that all roentgenologists take a visual acuity test in dim illumination, or if this cannot be done, increase their diet in foods high in vitamin A. From 3 to 5 min. is suggested as the optimum time a normal individual should spend in accommodation before roentgenoscopy. Preliminary tests of dark adaptation under red and green faint illumination have shown a slight tendency to accommodate more rapidly to green than to red illumination, indicating the probability that green is the preferable color to use for dim illumination of the roentgenoscopic room.

Vitamin A deficiency: A field study in Newfoundland and Labrador, D. STEVENS and G. WALD (*Jour. Nutr.*, 21 (1941), No. 5, pp. 461-476, fig. 1).—Dark adaptation tests with a specially designed portable adaptometer were conducted on children and adults in the region of northern Newfoundland and Labrador served by the International Grenfell Mission. The threshold of the completely dark-adapted eye was measured before and after vitamin A therapy, deficiency being indicated by what is termed the "vitamin A-labile threshold—one that, whatever its initial level, is lowered at least 0.3 logarithmic unit within 2 weeks of regular vitamin A supplementation. In practice a threshold which reacted to vitamin A usually did so within 1-6 hr." Vitamin A-labile thresholds were found in only 9.7 percent and clinical night blindness in not more than 3 percent of the subjects. About half of the A-labile thresholds were within what is considered the normal range of initial levels. About half were found in subjects suffering also from beriberi, although the two conditions were independent of each other. Both of the deficiency states were most prevalent in February and March, and with the exception of infants were found chiefly in adults.

Title 21—Food and drugs.—Chapter I—Food and Drug Administration. Part 15—Wheat flour and related products; definitions and standards of identity, P. V. McNUTT (Natl. Arch. U. S. Fed. Register, 7 (1942), No. 81, p. 3055).—An order issued by the Federal Security Administrator under date of April 23, 1942, further postpones the effective date of requirement of the ingredient riboflavin in enriched flour and related products to April 20, 1943 (E. S. R., 86, p. 553), at which date it is expected that the supply of riboflavin, in appropriate forms, will permit the production of the foods on a scale that would meet current demands.

The pathology of riboflavin deficiency in the rat, J. H. SHAW and P. H. PHILLIPS. (Wis. Expt. Sta.). (Jour. Nutr., 22 (1941), No. 4, pp. 345–358, figs. 16).—Riboflavin deficiency was produced in young rats on two rations—one a high-carbohydrate ration representing a modification of ration K₂ described by Wagner et al. (E. S. R., 85, p. 297) and the other the same ration with 49.5 parts of the dextrin replaced isocalorically by lard, raising the fat content to 39 percent. On the high-carbohydrate ration the signs and symptoms of riboflavin deficiency appeared later and were less severe than on the high-fat ration, these findings confirming those of Mannering et al. (E. S. R., 86, p. 425). The principal signs of the deficiency were a partial paralysis of the legs and characteristic dermatitis. The paralysis in its severe form was characterized by degeneration of the myelin sheaths of the nerves, accompanied by axis cylinder swelling and fragmentation. Myelin degeneration and gliosis were also observed in the spinal cord. The testes showed early and marked atrophy and the thymus an abnormally early involution. The more severe cases showed structural changes in the thyroid and adrenals.

These findings are thought to give further emphasis to the interrelationship between riboflavin and lipid metabolism and to suggest an intimate relationship with cellular metabolism.

Thiamin and pyrimidine studies on older subjects, A. W. WERTZ and H. S. MITCHELL. (Mass. Expt. Sta.). (Soc. Expt. Biol. and Med. Proc., 48 (1941), No. 1, pp. 259–263).—The thiamin and pyrimidine excretion in the urine of four men and four women from 66 to 75 yr. of age was determined by the fermentation method of Schultz et al. (E. S. R., 85, p. 727) for short periods on their customary unsupplemented diets and on the same supplemented with 2 mg. and later with 4 mg. of thiamin daily. Complete dietary records were kept during the experiment, and the thiamin content was calculated from the tables of Munsell (E. S. R., 84, p. 846) and of Booher and Hartzler (E. S. R., 83, p. 131).

The estimated thiamin content of the diet ranged from 620 to 1,224 μ g. daily and the excretion from 76 to 96 μ g. for the women and from 90 to 261 μ g. for the men. In all of the subjects there was a marked increase in excretion of thiamin following the intake of the 2-mg. supplement, but the responses of the individual subjects were not uniform. Six of the subjects excreted only about one-half to one-third as much thiamin during the first few days of the 2-mg. period as during the latter part of the period, while there was no marked change for the other two. On 4 mg. of thiamin four of the subjects excreted the same amounts of thiamin, or even smaller amounts, on the first day of the increased supplement as on the previous day. The percentage of thiamin excreted was not much greater and in some instances less than on the lower intake.

The apparent sex differences noted in the thiamin excretion were not noted with pyrimidine. With increase in thiamin intake the pyrimidine fraction in the urine increased, although to a lesser extent than the thiamin. At the

lower levels of thiamin intake the excretion of pyrimidine, calculated as thiamin, exceeded that of thiamin. The values of thiamin intake minus the excretion of thiamin plus pyrimidine were more nearly proportional to the intake of thiamin than was the thiamin excretion alone.

The authors had the technical assistance of F. C. Higgins.

Clinical studies on vitamin B₁ excretion determined by the fermentation method. H. POLLACK, M. ELLENBERG, and H. DOLGER (*Arch. Int. Med.*, 67 (1941), No. 4, pp. 793-804, figs. 4).—This paper presents in greater detail than a previously noted preliminary report (E. S. R., 85, p. 702) the method of estimating the status of vitamin B₁ by determining the excretion of this vitamin during 4 hr. following the intramuscular injection of 1 mg. of thiamin hydrochloride (values below 150 μ g. indicating deficiency), and the results obtained in the application of the test to normal subjects and patients with various clinical syndromes.

Of 31 normal persons, all had excretion values above 150 μ g., while values below this level were obtained with 13 of 139 patients with diabetes mellitus, 24 of 48 with gastrointestinal diseases, all of 4 with alcoholism, 40 of 162 with miscellaneous diseases, 3 of 10 with diseases of the liver and gall bladder, 7 of 21 with infections, and all of 5 with other evidence of vitamin B complex deficiencies. In all, 25 percent of 389 patients with various diseases excluding renal insufficiency and including alcoholism showed an insufficiency of thiamin according to the criterion adopted. Clinical analysis of the cases with excretion values below 150 μ g. gave evidence of anorexia, diarrhea, poor dietary intake, alcoholism, debilitating illnesses, prolonged toxic states, and hepatic dysfunction—conditions known to be frequently associated with thiamin deficiency. "This correlation helps to substantiate the inference that the response to the proposed 1-mg. load test may be of value in detecting the subclinical states of vitamin B₁ deficiency."

The influence of thiamine deficiency on citric acid excretion. A. H. SMITH and C. E. MEYER (*Jour. Biol. Chem.*, 139 (1941), No. 1, pp. 227-231).—In view of discrepancies in the literature concerning a possible relationship between thiamin deficiency and the excretion of citric acid in the rat, a series of paired feeding experiments was conducted which confirmed the conclusions of Sober et al. (E. S. R., 85, p. 274) that severe thiamin deficiency is accompanied by a decrease in citric acid excretion. However, contrary to the conclusion that thiamin is essential to the synthesis of citric acid, the results of the present study indicate that the decrease in citric acid excretion is correlated with a diminished food intake rather than with absence of thiamin per se.

The effect of thiamine deficiency in rats on the excretion of pyruvic acid and bisulfite-binding substances in the urine. M. E. SHILLS, H. G. DAY, and E. V. MCCOLLUM (*Jour. Biol. Chem.*, 139 (1941), No. 1, pp. 145-161, figs. 3).—Essentially noted from a preliminary report (E. S. R., 84, p. 706).

Determination of blood pyruvate in vitamin B₁ deficiency. P. K. LI and K. KATO (*Jour. Lab. and Clin. Med.*, 26 (1941), No. 8, pp. 1314-1321, figs. 2).—Blood pyruvate values for normal rats, determined by the micromethod of Lu (E. S. R., 82, p. 587), ranged from 0.50 to 1.20 mg. per 100 cc. (females) and from 0.60 to 1.30 mg. (males) and in starvation from 2.43 to 3.15 mg. per 100 cc. During subsistence on a vitamin B₁-free diet, increases in blood pyruvate amounting to more than 260 percent over the normal base level occurred by the end of the first month and to almost 500 percent by the end of the second month. During the first month loss in weight, weakness, and loss of appetite were the only noticeable signs, but during the second month definite neurological symptoms

developed. The injection of thiamin chloride was followed in most cases by a fall in blood pyruvate value within 2 hr, to about 50 percent of the preinjection level. The values obtained at 4 hr. were somewhat higher and were followed by further decrease by the sixth and eighth hours, beyond which no further decrease took place. Clinical improvement was marked even at the end of 4 hr. One animal failed to exhibit typical response to thiamin and died about 10 hr. later.

Inositol and spectacled eye in rats, P. L. PAVCEK and H. M. BAUM (*Science*, 93 (1941), No. 2421, p. 502).—In rats being used for the biological assay of vitamin B₆ on the diet of Halliday and Evans (E. S. R., 78, p. 570), denudation around the eyes similar to the spectacled eye condition described by Oleson et al. (E. S. R., 81, p. 450), except for the exudate shown by Unna (E. S. R., 86, p. 423) to be curable by pantothenic acid, was induced in almost 100 percent of the animals when nicotinic acid was given at weaning in addition to thiamin, riboflavin, pantothenic acid, and choline. The addition of 10 mg. daily of inositol, shown by Woolley to be curative for mouse alopecia (E. S. R., 86, p. 714), led to the prompt cure of the eye condition, with restoration of hair growth. Moreover, growth of the animals on the inositol-supplemented diet was greatly improved. It is concluded that inositol is the factor concerned with the regeneration of hair in the condition referred to as spectacled eye in rats, and that it also has a function in the growth of the rat.

A study of vitamin C nutrition in a group of school children, M. M. CRANE and P. W. WOODS (*New England Jour. Med.*, 224 (1941), No. 12, pp. 503-509).—A group of 39 boys and 47 girls from 7 to 16 yr. of age, chiefly of French-Canadian extraction and attending an elementary school in a Maine village, was studied for vitamin C status in the fall of 1938 and spring of 1939. With all of the subjects, single blood plasma ascorbic acid determinations were made, and the gums were examined for clinical evidence of vitamin C deficiency at both seasons. A group of 49, 23 from the original group and 26 selected from the other children in the school because of mouth conditions suggestive of vitamin C deficiency, also served as subjects in urinary tolerance tests (urinary excretion during a 6-hr. period following the administration of a test dose of 400 mg. of ascorbic acid), together with plasma tests. Vitamin C therapy in the form of 50 mg. ascorbic acid daily for about 3 weeks was given in the spring to 41 children with inflammation of the gums.

Only 2 children had plasma values in both fall and spring of 0.8 mg. or above. In the fall 46 percent and in the spring 63 percent of the children gave values below 0.4 mg. per 100 cc. The tolerance tests confirmed these findings, for those who had low plasma values excreted only a small proportion of the test dose. Inflammation of the gums was observed in 29 percent of the children in the fall and 51 percent in the spring and in general was associated with low plasma values. Improvement in the condition of the gums took place in about two-thirds of the children given vitamin C therapy. "The frequent finding of inflammation of the gums in these children and the evidence that this inflammation is associated with vitamin C undernutrition seem to indicate that for many of the children in the group there had been a deficiency of vitamin C intake sufficient to cause recognizable impairment of physical well-being."

A study of vitamin C nutrition in a group of school children.—II, Dietary evaluation, E. MURPHY. (Maine Expt. Sta.). (*Jour. Nutr.*, 21 (1941), No. 5, pp. 527-539, fig. 1; *abs. in Maine Sta. Bul.* 405 (1941), pp. 522-524).—Concurrent with the observations noted above, a study of the dietary habits, particularly with respect to vitamin C, was made of the children examined for

vitamin C nutrition. Attention was paid to the customary methods of cooking vitamin C-containing foods, and some analyses were made of foods cooked in a similar manner.

The principal potential sources of vitamin C were potatoes, cabbage, rutabaga, greens, tomatoes, and apples. Losses in vitamin C on cooking were found to amount to from 27 to 55 percent for potatoes, from 46 to 67 percent for cabbage, from 14 to 50 percent for rutabagas, and from 29 to 56 percent for the fiddlehead greens. Over two-thirds of the children were eating potatoes about once a day, and the amount of vitamin C obtained from this source was estimated to be about 15 mg. daily in the fall and 8 mg. in the spring, taking into consideration the losses on storage and cooking. Cabbage was eaten by only 18 of the 76 children observed in the fall and 19 of the 91 children in the spring. All but 4 of the fall group and 5 of the spring group used cabbage only in the cooked form. The lengths of the cooking periods reported most frequently were 30, 60, and 120 min. The consumption of rutabagas, the vitamin C content of 9 common varieties of which ranged from 44 to 61 mg. per 100 gm., was reported by only 18 children in the fall and 14 in the spring. Most of the greens reported were home-canned or home-salted and furnished very little vitamin C. Tomatoes were eaten to some extent by all of the children, apples by 40 in the fall and 38 in the spring. Home-canned wild strawberries and home-canned rhubarb were found to contain very little C.

The diets were considered to be markedly inadequate in vitamin C in 40 percent of the cases in the fall and 58 percent in the spring. Prolonged storage, poor cooking methods, and probably the use of varieties of low vitamin C content contributed to the low intake of the vitamin.

An ascorbic acid-like reducing substance in the buffy layer of centrifuged oxalated blood, A. M. BUTLER and M. CUSHMAN (*Jour. Biol. Chem.*, 139 (1941), No. 1, pp. 219-226).—Further information is reported on the occurrence in the buffy layer of normal and leukemic blood of an ascorbic acidlike reducing substance and on its seeming identity in chemical and physiological properties with ascorbic acid. Metaphosphoric extracts of both platelets and white blood cells from the buffy layer of both normal and leukemic bloods showed the same reducing property as that of ascorbic acid. Attempts to remove the reducing substance from the formed elements by diffusion into isotonic sulfate-tungstate solution resulted in little loss from the cells. The concentration of the active substance in the buffy layer of the blood cells of nonleukemic humans and guinea pigs was found to depend on the presence of ascorbic acid in the diet and is thought to provide an index of physiologically significant ascorbic acid.

Influences of erythrocytes and of leukocytes on stability and transfer of ascorbic acid in human blood, M. HEINEMANN (*Jour. Clin. Invest.*, 20 (1941), No. 5, pp. 467-471, fig. 1).—On account of the difficulty of separating leucocytes completely from erythrocytes in defibrinated blood, erythrocytes with and without leucocytes were observed, the differences between the two being ascribed to the leucocytes. When serum separated immediately from defibrinated blood was continuously agitated at about 25° C. and also at 37° in an atmosphere of air, ascorbic acid was destroyed at a rate of from 5 to 10 percent of the original content in about an hour. In the presence of erythrocytes serum ascorbic acid was protected from destruction, while in the presence of leucocytes there was an increased loss of ascorbic acid. Simultaneous determination of ascorbic acid in whole blood showed that the decrease was due to actual loss and not to oxidation of ascorbic acid to its dehydro form. Under nitrogen, ascorbic acid added to serum was transferred to the leucocytes but not to the erythrocytes. The amounts transferred were proportional to the number of leucocytes.

No transfer of ascorbic acid from serum to erythrocytes up to 5 million per cubic millimeter was detected in blood exposed to air. Different protein concentrations in serum obtained by ultracentrifuging did not affect the rate of deterioration of ascorbic acid on exposure to air, thus indicating that ascorbic acid is not bound to serum proteins.

Effect of vitamin C on workers exposed to lead dust, S. W. MARCHMONT-ROBINSON (*Jour. Lab. and Clin. Med.*, 26 (1941), No. 9, pp. 1478-1481).—The routine administration of 50 mg. of ascorbic acid daily, distributed in two pieces of chewing gum, to each of a group of over 30 men engaged in various types of work, some of which involved exposure to lead dust, in the assembly of passenger automobiles was followed in a short time by a noticeable decrease in muscular fatigue, as shown by increased efficiency and a feeling of well-being at the end of the work period. During the first 5 mo. the basophilic aggregation counts showed slow but progressive decline. During the next 7 weeks the observations were extended to weekly urine analyses for lead and stipple cell counts. Of the 303 men examined during this period, 243 had an average urinary lead excretion below 100 γ and the remaining 600 above 100 γ per liter. One subject who excreted 541 γ per liter was found to have had acute lead intoxication several years earlier, but was not exposed at the time. It was concluded that under the influence of Vitamin C the lead previously fixed in the bones in this subject was being excreted. All of the subjects excreting more than 100 γ per liter were studied 4 mo. longer, but with no decrease in lead excretion and no change from normal in the basophilic aggregates or stipple cell counts.

These findings are discussed with reference to the somewhat contradictory findings in the literature. The suggestion is made that "the effect of lead on the human economy may be only indirectly toxic, the absorption of lead producing an avitaminosis C. This is the condition of vague symptoms known as chronic lead poisoning, but is in reality chronic subclinical scurvy."

TEXTILES AND CLOTHING

A comparison of five methods of measuring fineness of cotton fibers, M. A. GRIMES. (*Tex. Expt. Sta.*). (*Textile Res.*, 11 (1941), No. 11, pp. 459-466).—The five methods, applied to each of five cottons, included determinations of weight per square inch, area of cross sections, and widths of fibers collapsed, flooded with sodium hydroxide, and mercerized without tension. Identical fibers were used where methods permitted. All of the methods employed were quite time consuming.

The results, presented in detail and discussed, led to the conclusion that small differences may not be determined with certainty, but that wide differences in fineness may be detected by any of these methods. "It is suggested that the choice of method be made after deciding whether the area the fiber occupies or the quantity of material in the fiber is the information desired.

Formation of cellulose particles in the living cotton fiber, W. K. FARR (*Rayon Textile Mo.*, 22 (1941), No. 9, pp. 59-62, figs. 2).—This is a review of an article previously noted (*E. S. R.*, 87, p. 42).

Qualitative methods of identifying soybean fibers in mixtures of casein fiber, wool, or other textile fiber, S. WILLIAMS and W. H. TONN (*Rayon Textile Mo.*, 22 (1941), No. 9, pp. 63-64).—The system of identification proposed is based upon differences in the amino acid composition of the proteins of these fibers. Thus, casein and soybean proteins contain tryptophan and cystine, but soybean protein is lacking in alanine, hydroxyproline, glycine, isoleucine, and serine, all of which are contained in casein. The tests described are well-known

protein color tests used for detecting the presence of specific amino acids and include the α -naphthol hypobromite test for arginine, the ninhydrin test for β -alanine, the Adamkiewicz test for tryptophan, the vanillin test for tryptophan, the Morse test for hydroxyproline, solubility in hot 18 percent NaOH, and the sulfur test for cystine. The color responses of soybean fiber (three sources), casein (including Lanital and pigmented and nonpigmented Aralac), wool, silk, and Nylon to these several color tests were such as to permit qualitative differentiation of the fibers. The results of the tests are tabulated.

Oxidation of wool keratin by potassium dichromate, R. O. DONOHUE and R. EDGAR. (Iowa Expt. Sta.). (*Amer. Dyestuff Rptr.*, 31 (1942), No. 5, pp. 101-104, 123).—According to the authors' abstract, "the effect of a mordanting bath's acidity on plain-woven wool, prepared with benzene and saponin or with soap and naphtha, has been measured by determination of the mordanted wool's ash, chromic oxide, weight, total nitrogen, total sulfur, sulfate sulfur, and wet strength after 1 hr. at 100° C. in 50 volumes of water or potassium dichromate, 3 percent the weight of the wool and 0.0000 to 0.5000 N as to hydrochloric acid. The mordanted wool's ash, equivalent to chromic oxide computed from chromium, and weight each attained a maximum at 0.0200 N hydrochloric acid but decreased with increasing concentration of acid. The wool's sulfate sulfur was removed with soap and naphtha and that of wool prepared with benzene and saponin was lowered to less than 0.1 percent by mordanting except in the bath 0.0200 N as to hydrochloric acid. None of the mordanted wools increased in sulfate sulfur. The wool's wet strength decreased more rapidly than its nitrogen or nonsulfate sulfur, though values for these constituents of wool mordanted in a bath 0.0200 N as to hydrochloric acid are approximately those of the water-treated wool. The method of preparing wool for experimental use appears to influence its degradation by acidic potassium dichromate, since the ratio of nitrogen to nonsulfate sulfur decreases with increasing concentration of acid for wool prepared with soap and naphtha but remains constant between 0.1500 and 0.3500 N hydrochloric acid for wool prepared with benzene and saponin."

A theoretical approach to the problem of yarn strength, R. R. SULLIVAN. (Tenn. Expt. Sta.). (*Jour. Appl. Phys.*, 13 (1942), No. 3, pp. 157-167, figs. 9).—"An idealized yarn composed of fibers with specified properties is treated analytically with the aim of determining the yarn strength at any degree of twist. The results are presented in the form of equations and curves which relate the yarn strength to the fiber properties and the degree of twist. Two cases are studied—(1) all fibers alike; (2) fiber properties variable from fiber to fiber. In the latter case the mathematical expectation of the yarn strength at any yarn cross section is obtained. It is found that the optimum twist multiplier is largely determined by the fiber length, fiber fineness, and coefficient of friction, whereas the maximum yarn strength (corresponding to the optimum twist multiplier) is more strongly dependent upon the intrinsic fiber strength than upon the other fiber properties studied."

Physical properties of cotton, linen, and rayon-mixed fabrics with all-linen and all-rayon fabrics, H. M. FLETCHER, M. G. SHELDON, and C. E. ZINK. (Kans. Expt. Sta.). (*Rayon Textile Mo.*, 22 (1941), No. 12, pp. 65-67; 23 (1942), No. 1, pp. 71-72).—The data obtained in the various physical measurements are tabulated and analyzed statistically to determine the significance of differences in the physical properties of the different kinds of fabrics. In the one group containing five linen and viscose rayon mixtures, two all-linen, and two all-viscose rayon fabrics, the breaking strength of the linen was greater than that of the rayon or the mixtures by a very highly significant amount. In the other group containing three all-viscose rayon fabrics and four viscose

rayon and cotton mixtures, the rayon had a greater breaking strength than the mixtures, the difference in this case also being very highly significant.

"In both groups enough linen and cotton were in the mixtures to diminish the decrease in the wet breaking strength. Linen in the linen and rayon group was least resistant to abrasion. In the rayon and cotton group the rayon and mixtures were equally resistant to abrasion. Launderings diminished the breaking strength of the fabrics in the linen and rayon group but not of those in the rayon and cotton group.

"For elongation the rayon and mixtures in the linen and rayon group were greater than the linen by a very highly significant amount. In the rayon and cotton group the rayon was greater than the mixtures by a very highly significant amount.

"The rayon and cotton group shrank less than the linen and rayon group and had no significant differences between fabrics, launderings, or warp v. filling. There were significant differences between fabrics and warp v. filling in the linen and rayon group. The mixtures shrank more than the linen, and there was no significant difference between the mixtures and rayon. The shrinkage in the warp was greater than that of the filling by a highly significant amount."

Physical analysis of 31 qualities of outing flannel, M. B. HAYS and G. B. FRANKENBERG. (U. S. D. A.). (*Jour. Home Econ.*, 33 (1941), No. 6, pp. 404-408).—The 31 fabrics, 22 plain weave and 9 twill, included representative qualities from all the large manufacturers. The results of the physical analyses showed that the twills were heavier and had more warp yarn per inch and a higher warpwise breaking strength than the plain-weave flannels. Lengthwise shrinkage averaged 8 percent for the twills and about 5 percent for the plain weaves, but shrinkage in the filling direction was less than 2 percent for both groups. Air permeability ranged from 28 to 147 cu. ft. and from 27 to 108 cu. ft. of air per square foot per minute for plain and twill weaves, respectively, and in general the thick fabrics had low air permeabilities, although the relationship was not linear. About half of the dyed materials showed appreciable or objectionable change in color after 40 hr. in the Fade-Ometer or when laundered with neutral soap at 105° F. The woven-stripe fabrics in light tints showed the best color permanence and the plain pastels the poorest. On the basis of these analyses, specifications for two minimum qualities of outing flannel are proposed as an aid to consumer buying.

Study reveals properties of flannels made from new and reprocessed wool (*Textile Res.*, 12 (1942), No. 3, pp. 25-27).—This is a popular summary of the study by Bailey noted previously (E. S. R., 86, p. 570).

New methods for determining shrinkage of rayon fabrics, A. J. KELLNER (*Rayon Textile Mo.*, 22 (1941), No. 9, pp. 68-69, fig. 1).—The tension presser and the testing procedure described have been essentially noted from another source (E. S. R., 86, p. 715). It is considered that the use of this tension presser, which restores the rayon fabrics to shape by applying controlled tension during pressing, affords information on the fabrics which will give a true indication of the serviceability of garments made from them.

Relative merit of three rayon taffetas in consumer service, A. SOMMARIPA (*Rayon Textile Mo.*, 22 (1941), Nos. 9, pp. 70-72; 10, pp. 65-66, figs. 3).—This paper presents the results of wear tests on three rayon taffeta fabrics in which deterioration due to distortion was taken as the index of serviceability. Laboratory tests conducted on the new fabrics by the A. S. T. M. method for determining the resistance to slippage appeared to have no forecast value of the performance of the fabrics in actual wear.

HOME MANAGEMENT AND EQUIPMENT

[Consumer economics research by the Iowa Station] (*Iowa Sta. Rpt. 1941, pt. 1, pp. 229-231*).—In this progress report are presented summaries of studies in continuance of those noted earlier (E. S. R., 85, p. 284) and including a study of farm family incomes and expenditures, by M. G. Reid and L. G. Allbaugh; a study of egg-grading practices in relation to quality of eggs and consumers' preferences, by Reid; and a study of the economy of household production of bread and of fruits and vegetables in the home garden, by M. Tiffany.

Improving the occupational status of rural women, D. DICKINS (*Miss. Farm Res. [Mississippi Sta.], 5 (1942), No. 3, pp. 1, 6*).—In a survey conducted in 1938-39 occupational data were obtained from 2,576 white women 16 yr. and over residing in a random sample of rural areas in a 10-mile radius of five communities of Mississippi. The main occupation of 82 percent of these women was household or farm work, or a combination of the two. Only 11 percent had had as much as 150 days of gainful nonfarm work in the year preceding the interview. Seven percent were in school or taking special training. Limited opportunities for earning by work off the farm, multiplicity of home duties including care of young children, and age limitations were the chief factors responsible for the large proportion of women limiting their activities to the home and farm. A recent survey in two of the original five regions now designated as defense areas showed an average increase of about 20 percent in the number of women employed in these areas. The new employees, however, were single girls from the city, town, or village. Likewise, need for additional help in the textile plants in nondefense areas was met largely by employment of women from the towns. The main occupation of the white women in rural areas is still household and farm work, and any improvement in the occupational status will come through improving farm homemaking.

Family income and expenditures: Five regions.—II, Family expenditures. Farm series, D. MONROE, D. S. BRADY, M. PERRY, K. CRONISTER, and E. D. RAINBOTH (*U. S. Dept. Agr., Misc. Pub. 465 (1941), pp. V+366, figs. 8*).—This report, dealing with expenditures (in relation to income) of farm families in 13 type-of-farming sections surveyed in the study of consumer purchases, constitutes part 2 of the farm series report; part 1, dealing with incomes, is issued in three volumes (E. S. R., 83, p. 286). Information similar to that previously reported for urban and village families (E. S. R., 84, p. 856) is given with regard to the consumption patterns and the distribution of expenditures of these farm families.

Some contrasts in the levels of living of women engaged in farm, textile mill, and garment plant work, D. DICKINS (*Mississippi Sta. Bul. 364 (1941), pp. 53, figs. 5*).—The farm-reared women included in this study were between 17 and 35 yr. of age and represented (1) an industrial group—those who had worked at least 12 mo. out of the past 2 yr. in one of three textile mills or two garment plants selected—and (2) a farm group—those who during the past year had resided in the home of a farm operator located in a random sample of rural areas within a 10-mile radius of these five plants, provided these women had assisted in producing one or more farm products for sale. The incomes of the married industrial women and their families were greater than the incomes of the married farm women and their families, the greater difference being not in the amount of income but the composition of income. Families of farm women spent less cash for food, fuel, and housing, since these were furnished by the farm, than did families of industrial women. At lower

income levels industrial women spent more on clothing and personal care than did farm women. Garment plant women and their families, most of whom lived in the open country, resembled the farm women with owner husbands in that they lived in less crowded quarters, participated more in social organizations of the community, and saved more than did textile mill women and families of farm women with nonowner husbands. Although the incomes of single factory women were larger than those of single farm women, their situation as compared with farm women was not always better. Industrial employment of farm-reared women did not always provide a better living than did the farm. This was particularly true of employment in textile mills, since mill workers lived in mill villages where living space was limited and families were large and dependent upon the mill.

Home-grown farm produce used on Michigan farms, J. C. DONETH (*Michigan Sta. Quart. Bul.*, 24 (1942), No. 3, pp. 240-245).—The amounts and values (at farm prices) of home-grown farm products used by households on 232 Michigan farms during 1940 were computed from records kept by the farmers. The summaries for all farms and for the farms in the four different type-of-farming regions showed the values and in most cases the amounts of 14 categories of products, including wood for fuel. The value of all of these home-grown products averaged \$285 per farm (range, from \$69 to \$670) and the house rental charge, computed as 10 percent of the estimated value of the farmhouse, averaged \$183 (range, from \$11 to \$553).

[Household equipment studies by the Maine Station] (*Maine Sta. Bul.* 405 (1941), pp. 427-429).—This progress report (E. S. R., 85, p. 717) by M. M. Monroe and P. S. Greene summarizes the findings from tests of 1939-40 models of electric ranges sold in Maine and progress of continued studies of the effect of the method of heat application and accompanying oven conditions upon the flavor and texture of baked foods and of the performance of wood ranges heated by distillate burners.

The operating efficiency of small electrical food mixers, L. J. PEET (*Iowa Sta. Rpt.* 1941, pt. 1, p. 182).—A progress report on this project (E. S. R., 85, p. 285).

MISCELLANEOUS

Research procedures, W. D. ELIISON. (U. S. D. A.). (*Agr. Engin.*, 22 (1941), No. 7, pp. 249-252, fig. 1).—This is a discussion of the general process of the analysis of the problem and the planning of effective experimental inquiry.

Annual report of the director [of Delaware Station], 1941, G. L. SCHUSTER (*Delaware Sta. Bul.* 235 (1941), pp. 41, figs. 4).⁵

Report on agricultural research [of Iowa Station] for the year ending June 30, 1941, I, II, R. E. BUCHANAN ET AL. (*Iowa Sta. Rpt.* 1941, pts. 1, pp. 278, figs. 35; 2, pp. 79, figs. 13).—Part 1 of this report includes reports on all active projects except those relating to work coordinated under the Iowa Corn Research Institute, which is included in part 2.⁵

Report of progress [of Maine Station] for year ending June 30, 1941, [F. GRIFFEE ET AL.] (*Maine Sta. Bul.* 405 (1941), pp. [81+401-535, figs. 7]).⁵

Informe de la Estación Experimental de Puerto Rico, 1939, [A. LEE] (*Puerto Rico Sta. Rpt.* 1939, Span. ed., pp. II+136, figs. 43).—A Spanish edition of this report (E. S. R., 84, p. 718).

⁵ The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Annual Report [of Puerto Rico University Station, 1941], J. A. B. NOLLA ET AL. (*Puerto Rico Univ. Sta. Rpt. 1941*, pp. VIII+70, figs. 9).⁵

Farm Research [April 1, 1942] (*Farm Res. [New York State Sta.]*, 8 (1942), No. 2, pp. 20, figs. 15).—In addition to articles abstracted elsewhere in this issue, this number contains Chemical Warfare on the Farm, by P. J. Chapman and J. M. Hamilton (pp. 1, 9); Dusts as Supplement to Sprays To Meet Labor Shortage, by G. L. Mack (pp. 4, 14); and An Annual Necessity—Cleaning and Treating Seed Grain, by W. Crosier (p. 20).

Farm and Home Science, [March 1942] (*Farm and Home Sci. [Utah Sta.]*, 3 (1942), No. 1, pp. 16, figs. 25).—In addition to articles noted elsewhere in this issue, this number contains Utah Farm Outlook for 1942 Favorable, by W. P. Thomas (pp. 1, 4); Nutrition in the Defense Program, by C. B. Clayton (pp. 5, 15); The Western Regional Research Laboratory, by T. L. Swenson (pp. 12-13); and College Buys Shorthorn Bluebloods, by F. F. McKenzie (p. 16).

⁵ The experimental work not previously referred to is for the most part noted elsewhere in this issue.

NOTES

California University and Station.—Dr. Harry R. Wellman, professor of agricultural economics and agricultural economist, has been appointed director of the Giannini Foundation.

Cornell University and Station.—Dr. C. E. F. Guterman, assistant director of the station, has been appointed director of research and director of the station, effective July 1. Sarah G. Blanding, director of the New York State College of Home Economics, has been appointed the first dean of that college, as of July 1. Dr. J. H. Bruckner, acting head of the poultry department for the past 2 years, has been appointed head of the department.

The winter short courses, which have been in operation at the college for exactly 50 years, have been suspended for the duration of the war. More than 10,000 people have been enrolled in these courses during the half century.

New York State Station.—Dr. A. J. Heinicke, head of the pomology department of the Cornell University and Station, has been appointed director, this to be effective on the retirement of Director P. J. Parrott on September 1.

According to a recent station note, work carried on with gelatin in connection with ice cream some years ago has been cited by a medical research group at Northwestern University as furnishing a lead for the use of gelatin in transfusions in the case of severe bleeding. The station studies were concerned with the use of gelatin in ice cream and the investigation of gelatin as a protein, but are of interest as another instance of research of a fundamental nature finding an application entirely outside the field in which it had its beginning.

Increased State appropriations to the extent of \$20,000 have been granted. Of the total amount, \$10,000 is for studies looking toward greater diversification on the fruit farms of the State, particularly in the Hudson Valley, and will permit increased testing of the station's new fruit varieties, especially small fruits, and fertilizer and cultural practices as related to fruit growing. Provision is also made for an extension of the experiments on the control of the fruit moth with parasites. An allotment of \$5,000 has been made for studies of the control of the corn earworm and the European corn borer and another of \$5,000 to extend the studies on the canning of natural cheese to commercial production.

Association of Official Agricultural Chemists, Incorporated.—Owing to war emergency work the executive committee has decided that the annual meeting of this association scheduled for October 27–29 will not be held.

Bibliofilm Service, U. S. D. A. Library.—Under this service, which is now operated directly by the Department Library, copies of publications listed in the *Record* will be available from the Library in either microfilm or photostat form. For microfilms, a flat charge of 50 ct. is being made for any single article from any single volume of a periodical regardless of the length of the article. For books and bulletins, 50 ct. is charged for each 50 pages or fraction thereof. For photostats, legible without magnifying equipment, the rate is 10 ct. for each page of text, with a minimum charge of 50 ct. per item. Payment for photostats or microfilms may be made by coupons, and these may be ordered in any quantity by sending a check or money order, made payable to the Treasurer of the United States, to the Library, U. S. Department of Agriculture, Washington, D. C.

EXPERIMENT STATION RECORD

VOL. 87

SEPTEMBER 1942

No. 3

PLANT SCIENCE RESEARCH INSTITUTIONS AND PERSONNEL IN CENTRAL AND SOUTH AMERICA

The increasing realization by agricultural research workers of the full meaning of hemispheric solidarity is being reflected in a demand for more information as to the institutions carrying on investigations in Central and South America. Far too little has been known of these southern neighbors and their contributions to agricultural science. Despite numerous attempts at coverage either in connection with world lists or on a more restricted basis, even the roster of institutions has lacked much in completeness. As to lines of work and personnel even less information has been available.

A systematic attempt to rectify this situation to the extent that it involves plant science has now come to fruition in two articles appearing in the March and May 1942 issues of *Chronica Botanica*. The first of these is a list of plant science institutions, laboratories, experiment stations, museums, gardens, societies, and commissions in Central and South America. The second gives data as to the plant scientists themselves. Both lists were prepared by the staff of that journal with the aid of a subsidy received from the division of agriculture of the Office of the Coordinator of Inter-American Affairs.

The list of institutions deals with those of agricultural, botanical, horticultural, forestry, pharmacognostical, phytopathological, and microbiological significance and is a revision of the data dealing with Central and South America in the world list issued by *Chronica Botanica* in 1938. It represents, however, a rechecking of all data by journal representatives from the countries concerned and at least 200 others in a position to be of assistance.

The total number of major entries is about 650. Of these over 100 are scientific societies, academies, and commissions, including 13 chapters of the American Society of Agricultural Science. Departments of agriculture or forestry engaged in research are listed as experiment stations. Chemical, geological, and bacteriological institutions have been listed only if they are regularly engaged in research in the plant science field. "Small stations and experimental farms without a definite program of research are not always mentioned,

particularly not in large countries or if they belong to more important institutions, already listed." For this and other reasons the list as a whole is thought still to be incomplete.

The list of workers is stated to be the first of its kind and therefore of a more or less preliminary nature. Nevertheless it is based upon questionnaires sent to all known institutions, laboratories, museums, gardens, etc. This information was supplemented by a check of contributions to Central and South American journals and verified by distribution to from 2 to 10 correspondents in most of the respective countries.

As thus prepared the list contains about 2,000 names, together with degrees, positions, and brief enumerations of subjects of current and planned work. "All of the workers included," it is stated, "are not research workers in the sense in which this word is used in Boston or in London; we have endeavored to include all workers whose activities are equivalent to those of the men listed in the well-known lists of 'Research Workers in . . . the British Empire' of the Imperial Agricultural Bureaux of London. Workers in northern temperate countries will, without doubt, understand that, especially under the present circumstances, there are imperative reasons which made us include a certain number of practical and administrative workers and authorities in our field. . . . A few zoologists, entomologists, and geologists have been included, when they are known to have very general biological interests or when they are important men in a certain territory, able and willing to help and guide visiting plant scientists."

In conclusion, the compilers express the hope that the list may be "of some use for the purpose for which it has been prepared—the promotion of inter-American relations in the plant sciences." It may reasonably be assumed that this modestly expressed aim will be abundantly realized. Without doubt the two lists will prove very timely and useful.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical investigations by the New Mexico Station] (*New Mexico Sta. Rpt. 1941*, pp. 47-48, 64-66).—A study of the composition of range grasses and browse gathered at varying stages of maturity and the composition and food value of piñon nuts (*Pinus edulis*) and of pecans grown under irrigation (including analyses) are briefly reported upon.

[Chemical investigations by the Tennessee Station] (*Tennessee Sta. Rpt. 1940*, pp. 55-60, figs. 2).—Work on sorghum sirup is noted by G. A. Shuey; and on composition of tobacco, alfalfa, lespedeza, milk, red raspberries, and strawberries, by E. K. Weathers.

[Chemical investigations by the Washington Station] (*Washington Sta. Bul. 410 (1941)*, pp. 31-32, 130-132).—This report contains notes on clarification of apple juice by A. M. Neubert (coop. U. S. D. A.), and on apple byproducts utilization, soft fruit products utilization, and vegetable products investigations, all by M. K. Veldhuis, Neubert, and C. W. Eddy.

Factors affecting the solubility of corn proteins, D. NAGY, W. WEIDLEIN, and R. M. HIXON. (Iowa Expt. Sta.). (*Cereal Chem.*, 18 (1941), No. 4, pp. 514-523).—A marked peptizing action of synthetic detergents upon corn proteins was demonstrated. Non-surface-active sulfonic acid salts were found to peptize only the salt-soluble fraction. Sodium salicylate also peptized only the same proportion of the protein as do inorganic salts. By minimizing the influence of factors altering protein solubility, it was found possible to isolate equal quantities of the various protein fractions by a variety of methods. Buffered extracting solutions gave more consistent results, apparently by counteracting adsorption.

The lipids of corn starch, J. W. EVANS and D. R. BRIGGS. (Minn. Expt. Sta.). (*Cereal Chem.*, 18 (1941), No. 4, pp. 443-461).—Cornstarch contains approximately 0.65 percent of lipides not present as a result of contact with lipid material during milling. Not a very high percentage of the lipides could be removed from starch by cold methanol extraction in a Soxhlet extractor, but by using the same solvent hot, from 93 to 95 percent of the lipides could be removed. This methanol extract was not made up entirely of fatty acids or lipides. Methanol removed the unsaturated acids more rapidly than the saturated. A portion of the phosphorus of cornstarch was removed by methanol extraction. An extraction that removed 95 percent of the lipides lowered the phosphorus content of the starch from 0.016 to 0.010 percent. Only a small portion of this phosphorus could be attributed to phosphatides. Small amounts of protein were also removed from starch by methanol extraction. The ether-soluble material in the methanol extract of the starch and the ether-extractable material liberated from the starch by acid and by diastatic hydrolysis were examined. For samples obtained from the methanol extract and the acid hydrolysis, the proportions of fatty acids were the same. Diastase hydrolysis did not liberate all of the fatty acids from the starch. The lipides in the methanol extract were found to be made up largely of free fatty acids. A positive test

for glycerol was obtained on the basis of the methanol extraction, however. The components of the lipide material (ether-soluble) in the extract were fatty acids 92.0 percent, of which 88.0 percent were free in the starch, unsaponifiable 8.0 percent, of which 75 percent consisted of sterols (30 percent of total sterols being free), and phosphatides 0.7 percent. The fatty acids liberated from starch by acid hydrolysis were composed of palmitic 21.2, stearic 7.8, undetermined saturated acids 1.0, oleic 37.7, linoleic 31.1, and linolenic 1.2 percent. The unsaturated fatty acids were separated and partially identified by bromination. Oleic acid was also identified by purification through the lithium salt. Acids with unsaturation greater than three double bonds were not found.

The fatty acid composition of the lipids of corn starch at various stages during the development of the corn kernel, J. W. EVANS and D. R. BRIGGS. (Minn. Expt. Sta.). (*Cereal Chem.*, 18 (1941), No. 4, pp. 465-468).—At 15, 22, 29, 36, 43, 50, and 57 days after silking of the corn, the authors determined the protein content of the separated starch, together with its ether-extract and phosphorus contents and its fat content by the hydrolysis method. On the basis of the total fat they further determined saturated and unsaturated fatty acids, unsaponifiable matter, oleic, linoleic, and linolenic acids, sterols, and a number of empirical values, tabulating and briefly discussing these analytical results.

Observations on the character of recording-dough-mixer curves on flours diluted with wheat starch, C. W. OFELT and R. M. SANDSTEDT. (Univ. Nebr.). (*Cereal Chem.*, 18 (1941), No. 4, pp. 435-442, figs. 3).—Three flours of widely divergent type were mixed with wheat starch to produce flour-starch mixtures with protein levels reduced in decrements of 1 percent. At predetermined baking absorptions recording-mixer curves were obtained from these mixtures similar to those from flours with the same naturally occurring protein content. Like curves were obtained also from flours from nine varieties of wheat, each variety being represented by samples at different protein levels and each flour reduced to a 9-percent protein level by dilution with wheat starch, with the addition of water and also of the baking ingredients normally used in commercial practice. The height of the curve was found to be largely determined by the protein content and the time required to reach minimum mobility not correlated with protein content but largely a varietal characteristic. The curve for each of the diluted flours retained much of the character of the original flour.

Microscopic examination of developing corn starch, J. W. EVANS. (Minn. Expt. Sta.). (*Cereal Chem.*, 18 (1941), No. 4, pp. 462-464, figs. 4).—Starch from kernels taken at 15, 22, 29, 36, 43, 50, and 57 days after silking was isolated and subjected to microscopic examination and photomicrography. Photomicrographs (270 X) of the starch grains of the first four of the stages named accompany the paper. The mature grains were from 10 μ to 25 μ in diameter and were mostly polygonal in shape, but the granules obtained from earlier stages of development were much smaller and of circular outline. All samples showed polarization figures.

Some analytical studies of the Persian lime, S. J. LYNCH (*Florida Sta. Bul.* 368 (1942), pp. 24, figs. 2).—Fruit from trees grown on five rootstocks were analyzed during three seasons to determine variations in juice content, percent acid, and percent soluble solids as affected by storage and maturity. The relation of juice content to specific gravity of the fruit as well as seasonal variation of juice and acid content of top-grade limes were also measured, and three types of juice extractors were compared. The data yielded by these observations are tabulated and briefly discussed.

Examination of fruit from trees grafted on rough lemon, grapefruit, Cleopatra, bittersweet, sour orange, and willowleaf sour orange during the growth period of the fruit indicated that fruits grown on rough lemon rootstock were of greatest weight and size throughout the growth period sampled, while fruits grown on the other rootstocks were generally of similar weight and size at any particular age sampled; that there is a general difference in fruit weight and size in different years; that the juice content of the fruit increased with maturity and was similar for the fruit from the different rootstocks at each sampling period; that after the 154- to 156-day age period, the juice content became either stationary or decreased slightly; that the percent acid content of the juice was not influenced either by the rootstock or by the age of the fruit as represented in the samples; that soluble solids content of the juice was not influenced by the rootstocks tested.

Identification of calcium pectate as the tissue-firming compound formed by treatment of tomatoes with calcium chloride, J. D. LOCONTI and Z. I. KERTESZ. (N. Y. State Expt. Sta.). (*Food Res.*, 6 (1941), No. 5, pp. 499-508).—After treatment of tomato tissues with pectic enzymes, which hydrolyze calcium pectate only to an extent somewhat less than 16 percent, treatment with acid followed by alkali extraction gave a quantity of pectic material which could only have been calcium pectate. Calcium pectate was found to be insoluble in dilute alkali when extracted for a few hours, while other naturally occurring pectic substances (except protopectin) are soluble. Dilute alkali extraction of calcium chloride-treated tomatoes removed all pectic materials except calcium pectate (and protopectin) which may be present. The residual tissue was then treated with hydrochloric acid, a treatment which converts calcium pectate to alkali-soluble pectic acid and leaves protopectin unchanged under the conditions of the experiment. Subsequent alkali extraction gave a quantity of pectic material which could have been derived only from calcium pectate. The quantity of calcium pectate derived from the extracts from calcium chloride-treated tomatoes was in all cases higher than that from the control samples. Most of the additional calcium contained by the preparations from treated tomatoes appeared to be present as calcium pectate. Calcium chloride-treated tomatoes lost their firmness upon immersion in ammonium-citrate solution, and when these tomatoes were again treated with calcium chloride, they did not regain their firmness, showing that the compound which was responsible for the stronger texture had been dissolved in the ammonium citrate solution. Analysis of this solution revealed the presence of pectic material. That the constituents associating with the calcium during the treatment are still present in the untreated canned tomatoes was shown by the firming observed upon the immersion of such fruit into a solution of calcium chloride.

The absorption of selenate and selenite selenium by colloidal ferric hydroxide, O. E. OLSON and C. W. JENSEN. (S. Dak. State Col.). (*S. Dak. Acad. Sci. Proc.*, 20 (1940), pp. 115-121, figs. 2).—At low concentrations iron hydroxide completely removes selenite selenium from solution, but at higher concentrations the adsorption can be expressed by the equation $\frac{x}{m} = kc^n$. Selenate selenium was not completely removed from solution even at very low concentrations. Its adsorption could not be expressed by the equation $\frac{x}{m} = kc^n$ for the whole range of concentrations used in this study. The results of this investigation are held to offer a possible explanation for the difference in availability to plants of selenites and selenates in the soil.

[Reports of referees and associate referees on analytical methods] (*Jour. Assoc. Off. Agr. Chem.*, 24 (1941), Nos. 2, pp. 205-430, figs. 20; 4, pp. 801-833,

846-837, 846-871, 900-915, *pls. 2, figs. 6*).—Reports in addition to three previously noted (E. S. R., 86, pp. 152, 153) were contributed from the State and Federal institutions respectively noted, State control and regulatory laboratories, etc., as follows:

No. 2.—Alcoholic beverages, by J. W. Sale (p. 205); proteolytic activity of malt, by S. Laufer (pp. 205-212); beer, by H. W. Rohde (pp. 212-215); heavy metals in beer, by W. H. Harrison (pp. 215-221); sulfur dioxide in beer and wine, by L. V. Taylor (pp. 221-223); denaturants (methanol) in distilled spirits, by G. F. Beyer (pp. 223-224); whiskey and rum, tannins in potable spirits, by P. Valer (pp. 224-232); cordials and liqueurs, by J. B. Wilson (p. 232); soils and liming materials, by W. H. MacIntire (pp. 232-233) (Tenn. Expt. Sta.); H-ion concentration of soils of arid and semiarid regions, by W. T. McGeorge (p. 233) (Ariz. Sta.); liming materials, solubilities of calcic and magnesian limestones in neutral normal ammonium acetate, by W. M. Shaw (pp. 244-249) (Tenn. Sta.); less common metals in soils, comparison of perchloric acid distillation and sodium carbonate fusion for determination of total boron in soil, by J. S. McHargue and W. S. Hodgkiss (pp. 250-252) (Ky. Sta.); fertilizers, by G. S. Fraps (pp. 252-253) (Tex. Sta.); preparation of fertilizer samples for analysis, by W. H. Ross, L. F. Rader, Jr., and J. O. Hardesty (pp. 253-263) (U. S. D. A.); nitrogen, by A. L. Prince (pp. 264-268) (N. J. Stas.); magnesium and manganese in fertilizers, by J. B. Smith and E. J. Deszyck (pp. 268-285) (R. I. Sta.); potash, by O. W. Ford (pp. 285-293) (Ind. Sta.); acid- and base-forming quality of fertilizers, by H. R. Allen and L. Gault (pp. 293-298) (Ky. Sta.); calcium and sulfur, by G. Hart (pp. 298-304); copper and zinc, by W. Y. Gary (pp. 305-317); eggs and egg products, by E. O. Haenni (pp. 317-319); detection of decomposition in eggs, by L. C. Mitchell and W. Horwitz (pp. 319-326); preservatives, by W. F. Reindollar (pp. 326-327); benzoate of soda, by A. E. Mix (p. 327); coloring matters in foods, by C. F. Jablonski (pp. 328-330); metals in foods, by H. J. Wichmann (pp. 331-335); arsenic, by C. W. Murray (pp. 336-337) (U. S. D. A.); copper, by C. A. Greenleaf (pp. 337-348); zinc, by E. B. Holland and W. S. Ritchie (pp. 348-350) (Mass. Sta.); fluorine (pp. 350-363), and lead (p. 363), both by P. A. Clifford; selenium, by A. K. Klein (pp. 363-380); fumigation residues in foods, by W. O. Winkler (pp. 380-383); fruits and fruit products (pp. 383-385), and fruit acids (pp. 386-391), both by B. G. Hartmann; potassium oxide in jams, jellies, and other fruit products, by C. A. Wood (pp. 391-393); P_2O_5 in jams, jellies, and other fruit products (colorimetric method), by H. W. Gerritz (pp. 393-397); sodium and chlorides in fruit and fruit products, by R. S. Pruitt (pp. 397-398); vitamins, by E. M. Nelson (p. 399); vitamin A, by J. B. Wilkie (pp. 400-403); vitamin B₁, by O. L. Kline (p. 403); canned foods, by V. B. Bonney (pp. 423-424); and tomato products, by L. M. Beacham (pp. 424-430).

No. 4.—Synthetic drugs, by L. E. Warren (pp. 801-803); benzedrine, by J. H. Cannon (pp. 803-806); methylene blue, by H. O. Moraw (pp. 806-809); aminopyrine, acetophenetidin, and caffeine, by J. Carol (pp. 809-810); sulfapyridine, by I. Schurman (pp. 810-814); vegetable drugs and their derivatives, by F. H. Wiley (pp. 814-815); physostigmine salicylate, by G. M. Johnson (pp. 815-817); arecoline hydrobromide, by H. R. Bond (pp. 817-818); phenobarital and theobromine, by E. C. Deal (pp. 818-821); plasmochin, by F. C. Sinton (pp. 821-823); drug bio-assays, by L. C. Miller (pp. 823-827); miscellaneous drugs, by C. K. Glycart (pp. 827-830); microchemical tests for alkaloids and synthetics, by G. L. Keenan (pp. 830-833); magnesium trisilicate, by E. K. Tucker (pp. 830-837); feeding stuffs, by L. S. Walker (pp. 846-848) (Vt. Expt. Sta.); ash, by J. L.

St. John (pp. 848-854) (Wash. Sta.); mineral mixed feeds, by A. T. Perkins (p. 855) (Kans. Sta.); lactose in mixed feed, by D. A. Magraw (pp. 855-858); vitamin D for poultry, by C. D. Tolle (pp. 858-859); carotene, by A. R. Kemmerer (pp. 859-865) (Tex. Sta.) (E. S. R., 87, p. 7); manganese in stock feeds, by J. B. Smith and E. J. Deszyck (pp. 865-867) (R. I. Sta.); ammoniacal and urea nitrogen (feeds), by W. B. Griem and Walker (pp. 867-871) (Vt. Sta. et al.); nonpigment colors, by S. S. Forrest (pp. 900-903); lakes and pigments, by G. R. Clark (pp. 904-906); analysis of color mixtures, by O. L. Evenson (pp. 906-908); tests for intermediates in coal-tar colors, by S. H. Newburger (pp. 908-910); and spectrophotometric color testing, by R. W. Stewart (pp. 910-915).

Apparatus for microevaporations, L. T. KURTZ. (Univ. Ill.). (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 2, p. 191, fig. 1).—Microquantities of solutions can be evaporated in the original narrow tube without loss by placing the tube in a steam jacketing device (a T tube) and at the same time blowing into the solution tube a small stream of hot air from a fine jet. This air is heated by passing over an electrically heated coil in a relatively wide tube to which the fine jet is sealed.

A rapid determination of concentration in liquid-in-liquid solutions, L. K. MANN and H. L. JETER (*Stain Technol.*, 17 (1942), No. 1, pp. 25-26).—The method described is based on the rapid agitation resulting from surface tension differences when alcoholic solutions of different concentrations are mixed on a microslide. The procedure is said to be applicable to a number of liquid-in-liquid solutions and has simplicity and rapidity to recommend it.

Effects of pretreatment on the estimation of organic acids in plant tissues, T. C. BROYER, T. L. ISAACS, and F. G. VIETS. (Univ. Calif.). (*Plant Physiol.*, 17 (1942), No. 1, pp. 69-79, figs. 5).—Composite expressed sap of fresh barley roots, obtained by expressing fluids without delay from completely macerated tissue, furnishes a composite sample representative of the solution in the tissue as a whole. When tissue samples cannot be studied directly, freezing is recommended. Frozen materials may be directly subjected to sap expression. Results for organic acid by these two methods of pretreatment agree favorably.

Treatment of either tissues or expressed fluids with concentrated alkali or acid is not recommended. Analyses of barley root tissues or expressed saps pretreated with alkali showed that sugars are decomposed, and organic acids not originally present in the tissues are produced.

The circular revolving brush as a tissue disintegrator, W. B. DAVIS. (U. S. D. A.). (*Plant Physiol.*, 17 (1942), No. 1, pp. 145-146).—Tissue such as potato tuber may be held against a brush made of palm (palmyra) fiber and the finely broken up material collected in a porcelain pan supported beneath the brush. To hold the fibers more compactly, or to control the width of the disintegrating surface, two lacquered lids from friction-top cans may be placed on the shaft of the motor on each side of the brush, with the turned-up edges of the lids facing each other. The fibers project $\frac{1}{2}$ in. or more beyond the lids. Tissues difficult to break up may be frozen first and then disintegrated, but the brush fibers are more likely to wear off and contaminate the frozen material. Even tough connective tissue in meat may be shredded while frozen. Stainless-steel wire brushes may take the place of palm or other fiber for disintegrating especially difficult types of tissue with a minimum of contamination.

Extension of the rapid volumetric micro method for determining arsenic, C. C. CASSIL. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem.*, 24 (1941), No. 1,

pp. 196-202, figs. 2).—The range of the rapid volumetric method for determining arsenic, previously considered as 5-500 $\mu\text{g.}$, has been extended to 10 mg. of As_2O_3 . It is possible to complete a determination in less than 10 min. after the necessary sample preparation. This method involves an arsine evolution, absorption in mercuric chloride-gum arabic solution, and an iodine titration. Results presented show that the accuracy of the method is 99.26 percent, with a standard deviation of 1.14 percent.

Determination of copper reduced by sugars: Use of ceric sulfate as a volumetric reagent. A. H. BEST, A. H. PETERSON, and H. M. SELL. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 2, pp. 145-146).—The proposed method differs from the ceric sulfate methods of Hassid (E. S. R., 79, p. 9) and others in that it involves the determination of cuprous oxide through the reduction of ferric ammonium sulfate with subsequent titration of the ferrous ion with ceric sulfate. Ceric sulfate gave sharper end points with the o-phenanthroline ferrous complex indicator than did potassium permanganate. The results obtained with a known dextrose solution and with an extract from tung leaves were essentially the same as those given by the standard Munson and Walker procedure and by that of Shaffer and Hartmann (E. S. R., 45, p. 111).

Decomposition of selenium-cystine in electrodialysis and acid hydrolysis. A. L. MOXON and A. E. SCHAEFER. (S. Dak. Expt. Sta.). (*S. Dak. Acad. Sci. Proc.*, 20 (1940), pp. 28-33).—Cystine and selenium-cystine cannot be separated by the electrical transport method. Selenium-cystine migrates to the cathode and anode chambers. In the electrodialysis of a water solution a portion of the selenium-cystine is decomposed to give elemental selenium. After a prolonged electrodialysis, the selenium concentration in the cathode chamber decreases, while the selenium concentration in the anode chamber increases. In sulfuric acid solution selenium-cystine is apparently decomposed to the cysteine form, giving a blue color with one of the modifications of the Folin uric acid reagent (E. S. R., 47, p. 504) without the use of sodium sulfite. In water solution selenium-cysteine is not formed until sodium sulfite is added. Selenium-cystine is decomposed on acid hydrolysis with a large loss of selenium. Elemental selenium was recovered in the precipitate formed during hydrochloric acid hydrolysis.

Rapid determination of silica in acid-insoluble silicates. G. MCCLELLAN (*Jour. Assoc. Off. Agr. Chem.*, 24 (1941), No. 1, pp. 111-113).—The special feature of this method consists in the solution of the melt in strong (3+1) nitric acid whereby about 95 percent of the silica is precipitated at once and evaporation to dehydrate silica is eliminated entirely, the dehydration being completed by adding solid ammonium chloride, perchloric acid, and sulfuric acid and boiling until oxides of nitrogen cease to come off and for 15 min. thereafter. Dilution with water and filtering off give a recovery of about 99.6 percent of the silica. It was found that a combination of perchloric and sulfuric acids gives a reasonably pure precipitate that filters rapidly. Perchloric acid alone gives a slow filtering, almost pure precipitate, while sulfuric acid alone gives an impure granular precipitate that filters rapidly.

Colorimetric determination of phosphorus in biological materials. R. A. KOENIG and C. R. JOHNSON (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 2, pp. 155-156).—The authors determined the effect of time on the development of the yellow phosphovanadomolybdate at various concentrations, the optimum acid concentration, the range over which Beer's law holds precisely at three wavelengths of light, and spectrophotometric calibration data for nine series of standard solutions. From the results of these experiments they devel-

oped a procedure for the rapid and precise determination of phosphorus in foods and other biological materials.

Relation of quantity of mineral elements in ash to ashing conditions in plant material, J. L. ST. JOHN and M. C. MIDGLEY. (Wash. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem.*, 24 (1941), No. 4, pp. 932-935).—The Official fusion method for chlorine determination and a perchloric-nitric acid digestion procedure similar to those of Gerritz (E. S. R., 75, p. 150) and of Gieseking, Snider, and Getz (E. S. R., 75, p. 153) for oxidizing out organic components prior to determinations of phosphorus, sulfur, potassium, chlorine, and calcium were used in comparison with ashing at 500°, 600°, and 700° C. for determinations in feeds of the elements named.

The calcium percentages found were nearly identical at the three ashing temperatures and in the digestion method. The phosphorus figures indicate a slight loss in ashing. Of sulfur, that found in the ash was from one-fourth to one-fifth of the total content of the feed as determined by digestion. The chlorine loss in ashing was much less than that of sulfur but increased with ashing temperature, reaching 40 percent loss from one of the samples at 700° ashing temperature. The potassium loss in ashing was small at 500° and at 600°, but at 700° there was a material loss of this element.

Factors influencing determination of sodium in plant material, W. M. BROADFOOT and G. M. BROWNING. (W. Va. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem.*, 24 (1941), No. 4, pp. 916-926).—A method using the Kolthoff zinc uranyl acetate reagent (E. S. R., 58, p. 608) in a modified procedure involving the Butler and Tuthill removal of phosphates by powdered calcium hydroxide (E. S. R., 67, p. 7) is described. The sodium content is calculated from the weight of the sodium uranyl zinc acetate dried at from 105° to 110° C. for 15 min.

Spectroscopic analysis of plant extracts for chlorophylls a and b, C. L. COMAR and F. P. ZSCHEILE. (Purdue Univ.). (*Plant Physiol.*, 16 (1941), No. 3, pp. 651-653).—A sample of about 10 gm. of fresh leaf tissue is disintegrated in the presence of acetone to which a small amount of calcium carbonate has been added. The mixture is filtered by suction, and the pigments are transferred to diethyl ether, treated with solid NaOH, and distilled. All the acetone is removed from the ether by distilled water, and the final solution is dried with sodium sulfate. If care is taken, emulsion formation can be avoided and quantitative results readily obtained. The absorption measurements are made at 6,600 and 6,425 a. u. The spectral region isolated should not exceed 30 a. u., and large amounts of scattered radiation must be avoided. Other wavelengths may be used when the carotenoid content is not too high. Absorption measurements made at 5,890 and 5,460 a. u. were found extremely sensitive to the presence of carotenoids. These pigments may cause appreciable error even at 6,000 a. u. but not at the wavelengths specified for the determination.

The use of the micrometric and other methods for the evaluation of soil structure, C. L. W. SWANSON and J. B. PETERSON. (Iowa Expt. Sta. and Univ. N. H.). (*Soil Sci.*, 53 (1942), No. 3, pp. 173-185, figs. 2).—The authors describe a micrometric method for the measurement of pore spaces in thin sections of soil. Projection of the microscopic images (174×) on a graduated scale facilitated the measurement of the pore spaces. For section cutting, the soil was embedded in synthetic resin media. (See also a note by Harper and Volk (E. S. R., 79, p. 303)). The micrometric method of determining pore space was compared with a moisture-tension method which yielded pore space values comparable to those obtained by the micrometric method for a cultivated and a virgin soil. A modified Coile (E. S. R., 76, p. 158) volume-weight sampling

tube was used for obtaining undisturbed cores of soil samples for the determination of capillary and noncapillary porosity.

It appeared that on wetting, the size of the pores was reduced by the swelling of the soil, and that this swelling effect was least in the larger pores. When the pore space relationships of a cultivated and a virgin surface soil horizon of Marshall silt loam soil were studied, the results showed that for the range (0.0117–1.17 mm. diameter) of pore sizes measured, the virgin soil had twice the volume of pores and a higher percentage of large pores than did the cultivated soil. An advantage of the microscopic study of soil pore space and structure in thin sections of undisturbed soil was found in the fact that not only quantitative but qualitative observations can be made of such properties as distribution, sizes, volume, and shapes of pores. The direct observation of the true structural pattern of the soil was found often to yield information necessary for the correct appraisal of the relationships between soil structure and such other natural phenomena as infiltration capacity and soil pore space. Combined with soil moisture studies it is shown to provide additional means for the interpretation and understanding of natural soil processes.

Determination of iron in soils and silicates by the mercurous nitrate method, R. KUNIN. (N. J. Expt. Stas.). (*Soil Sci.*, 53 (1942), No. 3, pp. 211–214).—The iron should be in the ferric state and should not be more than 0.1 N with respect to chlorides. The solution (at room temperature) is diluted to a volume of 200–250 cc., and 5 cc. of a 40-percent solution of NH_4SCN is added. The solution is then titrated with HgNO_3 (approximately 0.05 N was prepared in 5 percent HNO_3). The solution should be stirred vigorously and the HgNO_3 added dropwise and slowly near the end point, which is the absence of the red color. The solution becomes turbid when the end point is overrun. If the quantity of iron is very small (0.2–2.0 mg. Fe^{+++}), the titration may be performed in a volume of 25 cc. and a 0.005 N solution of HgNO_3 employed.

In the determination of iron in a soil or other silicate, the ions usually present are Fe^{+++} , Al^{+++} , Ti^{+++} , Mn^{++} , H^+ , K^+ , SO_4^{--} , and PO_4^{--} . The data indicate that none of these ions cause any appreciable error, the largest occurring when an exceedingly high concentration of phosphate ion was present. The mercurous nitrate method was compared with the stannous chloride method in the determination of the ferric oxide content of Colts Neck loam, Colts Neck colloid, Montalto clay fraction, and impure iron oxide. Closely agreeing figures were obtained.

Sampling of fertilizers, W. H. ROSS, J. O. HADESTY, and L. F. RADER, JR. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem.*, 24 (1941), No. 2, pp. 499–506, fig. 1).—Granulation of fertilizer mixtures to improve drillability has introduced new difficulties of sampling, because the granulated mixtures are more subject than are finely ground mixtures to segregation during shipment and handling of the bags. Mixtures containing components of markedly different particle size are also liable to segregation. Answers given by 32 States to a questionnaire on sampling methods showed considerable variation in choice of sampling tray, in number of bags sampled in proportion to size of shipment represented, and in manner of drawing the sample from each bag. Variations in the fineness of sieves used before subdividing for laboratory samples, in fineness of grinding of the samples, and in size of both inspection and laboratory samples were also revealed. The fertilizer laws of 14 of the 32 States answering the questionnaire do not specify any definite method for sampling.

Comparison of the Official and MacIntire-Shaw-Hardin methods for determining available phosphoric acid in fertilizer mixtures containing phosphate rock supplements, L. F. RADER, JR., and W. H. ROSS. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem.*, 24 (1941), No. 2, pp. 493–498).—The Official and

MacIntire-Shaw-Hardin (E. S. R., 79, p. 154) methods gave closely agreeing results in the determination of available P_2O_5 in commercial superphosphates of the ordinary type. The MacIntire-Shaw-Hardin method gave the higher results for available P_2O_5 in basic phosphates, such as tricalcium phosphate, heavily ammoniated superphosphates, and reverted phosphates, and as recommended for mixed fertilizers gave higher results for available P_2O_5 in the analysis of phosphate rock as such but the reverse when used as recommended for phosphate rock. It gave slightly the higher results for available P_2O_5 in ammoniated and non-ammoniated mixtures of the ordinary type.

Determination of metaldehyde in insecticides, E. A. LASHER. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem.*, 24 (1941), No. 2, pp. 489-493, fig. 1).—A procedure for the determination of metaldehyde is based on the depolymerization to acetaldehyde and subsequent titration of the "bound" sulfite. Aeration to remove the acetaldehyde during instead of after depolymerization and steam distillation improved the precision and shortened the procedure. Interference of the metaldehyde carriers was observed when a 1+4 dilution of sulfuric acid was used for the depolymerization but not when the normal acid was used.

Pyrethrum analysis: A study of the Seil method versus the mercury reduction method for the determination of pyrethrins, G. J. HARTZ, P. A. HENDRICKSON, and D. G. HOYER (*Soap and Sanit. Chem.*, 17 (1941), No. 12, pp. 123, 125, 127).

Ash determinations in foods with an alkaline balance.—II, Decomposition of alkali, calcium, and magnesium carbonates, H. J. WICHMANN (*Jour. Assoc. Off. Agr. Chem.*, 24 (1941), No. 2, pp. 441-454, figs. 8).—In continuation of a preceding study of ash components (E. S. R., 84, p. 730), the author finds that potassium carbonate heated in air is decomposed only slightly below 700° C. Precipitated calcium carbonate heated in air decomposes markedly between 600° and 650° and magnesium carbonate between 300° and 400°. At usual ashing temperatures, therefore, the stable compound of magnesium is the oxide, but the other two exist as the carbonates. Both magnesium and calcium carbonates are more stable under heat treatment in the presence of potassium carbonate, due to the formation of complex carbonates or mass action effect, or both. Carbonation of mixtures of calcium and magnesium oxides followed by heat treatment produces no dolomite. Adding potassium carbonate to such mixtures produces no triple alkali-alkaline-earth carbonates.

A survey of methods for the quantitative estimation of starch, M. P. ETHEREDGE (*Jour. Assoc. Off. Agr. Chem.*, 24 (1941), No. 1, pp. 113-119).—Of numerous methods for starch determination, the author prefers the acid hydrolysis to the diastase-hydrochloric acid method and a modification of the calcium chloride method. He points out that the acid hydrolysis procedure is inapplicable to natural materials, and finds the modified calcium chloride procedure to give more consistent results in the analysis of pure or commercial starches. The diastase-hydrochloric acid method was also found inferior to the calcium chloride method when used on pure or commercial starches. However, with natural materials the former gives fairly good results and perhaps should be used when there is too much filtering difficulty with the calcium chloride. For commercial starches the modified calcium chloride method gave better and much quicker results than did any hydrolysis procedure. It is believed that by careful control of heating and perhaps the use of a filter aid it can be used to good advantage on natural materials. It is believed that some other agent, such as formic acid, which was among those tried, might be better than calcium chloride, particularly with natural materials. Sulfosalicylic and formic acids both formed starch dispersions which filter quite easily.

Rapid determination of starch (root) with sodium hypochlorite, R. T. BALCH. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 4, pp. 246-248).—The Rask hydrochloric acid method (E. S. R., 57, p. 204) for starch in flours is satisfactory for certain materials, but it requires carefully controlled conditions as to temperature and time of reaction which cannot always be adhered to in analyzing certain other plant materials because they filter with extreme difficulty. Magnesium chloride and calcium chloride have been found fairly satisfactory in certain cases, but solutions of high salt concentration are required and complete dispersion of the starch under the conditions specified, particularly in the analysis of sweetpotato starch factory products, was not always obtained. Enzyme dispersion gave solutions which often filtered with difficulty and were too turbid for accurate polarimetric readings. Dispersion by means of hot sodium hypochlorite solutions was limited to root starches but provided the required rapid method for sweetpotato starch factory products.

Determination of starch in sausage and other meat products, W. C. McVEY. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem.*, 24 (1941), No. 4, pp. 928-931).—The residue remaining after digestion of the meat product with alcoholic potassium hydroxide is treated with hydrochloric acid, which dissolves the starch, as in the Rask method (E. S. R., 57, p. 204). After filtration the starch is precipitated by alcohol, and with the aid of filter-cel it is collected in a Gooch crucible, dried, and weighed. The proposed procedure is more rapid and convenient than the present tentative A. O. A. C. method, and it is reliable in the presence of hemicellulose material.

A new microchemical reaction for cellulose, E. E. POST and J. D. LAUDERMILK (*Stain Technol.*, 17 (1942), No. 1, pp. 21-24).—The test described is said to be applicable to fresh sections and commercial products and to differ from older techniques in that materials are not permanently altered. Two solutions are required, viz, 2 percent solution of I in 5 percent KI diluted with 9 parts of water containing 0.28 percent glycerine, and saturated aqueous LiCl. A detailed procedure is outlined.

A new method for the determination of cholesterol and its application to the estimation of the egg content of alimentary pastes, E. O. HAENNI (*Jour. Assoc. Off. Agr. Chem.*, 24 (1941), No. 1, pp. 119-147, fig. 1).—The unsaponifiable matter was extracted with ether after acid hydrolysis and saponification with potassium hydroxide. The cholesterol was precipitated by bromination to 5-6 dibromocholestanol. Cholesterol was then determined by an iodometric method based upon the reaction of the dibromo derivative with sodium iodide. Coprecipitation of bromine derivatives of wheat phytosterols was independent of the quantity of cholesterol present when the quantity of the cholesterol equaled or exceeded that of the wheat sterols. When the material examined contained less than 0.27 percent of unsaponifiable matter, it was necessary to add 10 mg. of cholesterol to the extract of the 10-gm. sample before determining the cholesterol content and to correct the result accordingly. The cholesterol content of egg solids was found not to be changed by prolonged storage of the frozen eggs or by commercial egg-drying processes.

Laboratory studies of oysters preparatory to the formulation of standards, E. O. HAENNI and K. L. WATERS (*Jour. Assoc. Off. Agr. Chem.*, 24 (1941), No. 4, pp. 945-961, figs. 4).—The authors investigated variation in composition of oysters within a lot, relation of shucking procedure to extent of bleeding and cleanliness, maximum water-absorptive capacity, measurement and development of free liquid, and change in count as a measure of overrun.

Determination of glycogen in oysters, H. N. CALDERWOOD and A. R. ARMSTRONG (*Jour. Assoc. Off. Agr. Chem.*, 24 (1941), No. 1, pp. 154-165).—The

authors found digestion with 30-percent sodium hydroxide at 80° C. for 30 min. to be sufficient for the disintegration of the tissue. Their procedure, therefore, substitutes a more dilute solution of the cheaper alkali and reduces digestion time to one-fourth of that now officially specified. The glycogen precipitate was also obtained in a better physical condition and in such a high state of purity that only a single precipitation was necessary. The quantity of alcohol required was reduced to 35 percent of that formerly required, and the entire determination could be completed in less than half the time required by the method now official.

Determination of potassium in fruit products: A study of the Wilcox cobaltinitrite method, C. A. WOOD (*Jour. Assoc. Off. Agr. Chem.*, 24 (1941), No. 2, pp. 454-461).—The Wilcox cobaltinitrite volumetric and gravimetric methods (E. S. R., 81, p. 326) for the determination of potassium, as applied by the author to the analysis of fruit products, requires less working time and analytical manipulation than does the official chloroplatinate procedure for this metal. Comparisons of the two methods by laboratories in widely different areas indicated good agreement.

Determination of peel oil in grapefruit juice, W. C. SCOTT. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem.*, 24 (1941), No. 1, pp. 165-170, figs. 2).—A method for the measurement of peel oil in citrus juices by steam distillation and recovery of the volatile constituents is presented. It is supported by data showing the constant relation between recoverable oil and the quantity originally incorporated in the juice. The range of oil percentages recovered from juices extracted by various commercial processes in 1938-39 is also shown.

Determination and significance of phenols in vanilla extract, A. K. BATES and F. E. ARANA. (U. S. D. A. and P. R. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem.*, 24 (1941), No. 2, pp. 507-512, figs. 2).—Comparison of total extractable phenols present during the curing process indicated that phenolic substances other than vanillin contribute to the flavor value. The vanillin was found to constitute usually from 50 to 60 percent of the total phenol content. Appreciable quantities of phenols not extracted by ether were found.

The danger of hydrochloric acid gas poisoning when testing salt-treated cream, H. C. HANSEN and R. S. SNYDER. (Idaho Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 3, pp. 189-194, figs. 3).—Employing a modification of the Babcock test procedure which permitted a determination of the kinds and amounts of gas released, the authors found that a 9-gm. sample of cream containing 13, 10, 7.5, or 5 percent salt when treated with the usual amount of sulfuric acid released approximately 487, 345, 260, and 173 cc. of hydrochloric acid gas, respectively. It was estimated that in small, poorly ventilated laboratories single samples of salted cream of 7.5 to 13 percent concentration will release hydrochloric acid gas in amounts above the maximum allowable for prolonged exposure, and that sets of 12 to 24 samples released the gas in amounts exceeding the maximum allowable for even short exposure. The gas was found to diffuse slowly, resulting in high concentrations of gas in the immediate vicinity of the operator, thus increasing the danger of injury.

A simple, rapid method for determination of leaf carotene, O. F. CURTIS, JR. (Cornell Univ.). (*Plant Physiol.*, 17 (1942), No. 1, pp. 133-136, fig. 1).—The carotene content of leaves may be quantitatively determined in from 0.2 to 0.3 gm. of the fresh tissue by dipping the fresh leaf for 1 min. into boiling water to inactivate oxidizing enzymes, blotting to remove excess water, and extracting with a solution of about 2 percent of methanol in petroleum spirit while grinding the leaf material with quartz sand in a mortar, the extraction being repeated to exhaustion. Chromatographic separation is effected on starch as adsorbant in a simple column. Chlorophyll and xanthophyll are adsorbed,

leaving all of the carotenoid hydrocarbons to be colorimetrically determined in the filtrate. The starch column is made ready for further use by extraction with a small quantity of ether, and may be used for five or more determinations.

Determination of pantothenic acid in normal blood and urine by microbiological technic, M. J. PELCZAR, JR., and J. R. PORTER (*Soc. Expt. Biol. and Med. Proc.*, 47 (1941), No. 1, pp. 3-7).—The microbiological method of assaying pantothenic acid from the growth response of *Proteus morganii* to the vitamin (E. S. R., 86, p. 588) has been applied to the blood and urine of human subjects, and the accuracy of the method determined by recovery tests on untreated and alkali-treated urines. Minimum, maximum, and average values obtained for the pantothenic acid content of the blood of 17 normal persons were 0.030, 0.039, and 0.059 μg . per cubic centimeter and of 24-hr. urine specimens from 9 persons 1.46, 6.79, and 3.81 mg. Recovery values from urine and blood were in close agreement with calculated contents.

Comparative study of a new simple method of sulfanilamide determination in blood, M. C. ANDREWS and A. F. STRAUSS (*Jour. Lab. and Clin. Med.*, 26 (1941), No. 5, pp. 887-889).

Determination of tannins by photocolormeter, M. ROSENBLATT and J. V. PELUSO (*Jour. Assoc. Off. Agr. Chem.*, 24 (1941), No. 1, pp. 170-181, figs. 9).—A spectral analysis of the blue color formed by the Folin-Denis reagent with tannic acid was made, the variables affecting the development of the blue color and a standard procedure that gives maximum transmission and stability compatible with good sensitivity were investigated, and the method was found accurate to within 0.5 percent.

Bleaching agents vs. potassium bromate in baking with dry milk solids, M. C. HARRIS and E. G. BAYFIELD. (Kans. State Col.). (*Cereal Chem.*, 18 (1941), No. 4, pp. 497-514, figs. 5).—The results obtained clearly indicated that the presence of 6 percent dry milk solids conferred some tolerance toward potassium bromate, increased the bromate requirement, increased the loaf volume, and improved the grain, texture, and crust color. This addition of dry milk solids increased the loaf volume and improved the grain and texture, crust color, and break and shred of loaves baked from bleached flours. The bread was gradually improved by the addition of increasing proportions of two commercial flour bleaches. Another bleach at intermediate dosages gave smaller loaf volumes, with a trend toward increased loaf volumes from heavier treatments.

The carotene content of the flours varied inversely with the quantity of bleaching agent used. The effect of bleaching agents and the oxidizing effect of potassium bromate differed in that the loaf volume or total bread score from bleached flours was not comparable to that obtained with potassium bromate at the optimum level and that bleaching whitened the crumb color, whereas potassium bromate did not. Varietal differences in behavior are also noted.

Secondary clarification with bentonite, M. KILBY (*Hawaii. Sugar Technol. Rpts.*, 4 (1941), pp. 75-76).—In the process of which the experimental operation is here described, bentonite was added to the clarified cane juice in the proportion of 1 lb. per ton and in the form of a 3-percent suspension run slowly into the juice as drawn from the Dorr clarifier. The indications obtained from these experiments were that a sugar of passable color and above 65 filtration rate could be made from even the worst juices, but that sugars of excellent refining quality and 90+ filtration rate could not be made continuously by this process.

Peach canning tests, L. O. VAN BLARICOM and A. M. MUSSER (*South Carolina Sta. Rpt.* 1941, pp. 42-49, figs. 3).—Pressure tests for maturity, storage periods previous to canning, the peeler and exhaust box equipment, amount of lye necessary to peel peaches, and varieties of peaches for canning are discussed.

The relation of maturity of the grapes to the yield, composition, and quality of raisins. H. E. JACOB (*Hilgardia* [California Sta.], 14 (1942), No. 6, pp. 321-345).—Effects of the degree of maturity of the fresh grapes upon the drying ratio, the size of the raisin berries, the weight per unit volume, the titratable acidity, and the content of sugar, potassium, calcium, magnesium, and phosphorus in the raisins were determined. Thompson Seedless (Sultanina) and Muscat of Alexandria grapes, picked at about weekly intervals, were dried by several methods, including most of the standard commercial procedures and certain others. The stage of maturity was taken to be represented by degree Balling of the juice from the fresh grapes. The tests on Thompson Seedless covered a range of from 18° to 29° Ball. and those on Muscat from 16° to 27°. As the maturity of the fresh Thompson Seedless grapes advanced, the drying ratio decreased regularly with the increase in Balling degree, so that the product of Balling degree \times drying ratio remained nearly constant. With the Muscat of Alexandria, the drying ratio decreased with advancing maturity of the grapes, but not proportionally, and the product of Balling degree \times drying ratio rose with the Balling figures. During the early part of the range of maturity studied, the sugar content of the raisins increased, whereas the total titratable acidity and insoluble-solids content decreased. The rate of these changes lessened as maturity advanced. Changes in the sugar and insoluble-solids content of the raisins nearly or quite ceased after the midpoint in the range of maturity of the grapes was reached, although the acidity of the raisins continued to decrease slowly. The potassium, calcium, and magnesium content of the Thompson Seedless raisins remained fairly constant, whereas the phosphorus content appeared to decrease somewhat with advancing maturity. In the Muscat raisins both the potassium and phosphorus decreased, the calcium and magnesium content remaining about the same.

The effect of pretreatment and subsequent drying on the activity of grape oxidase. A. A. HUSSEIN, E. M. MRAK, and W. V. CRUESS (*Hilgardia* [California Sta.], 14 (1942), No. 6, pp. 349-357).—The authors report a study of the effect of various dipping, sulfuring, and drying procedures on oxidase discoloration of grapes and raisins. The commercial cold-, mixed-, and soda-dip treatments decreased the oxidase activity when immersion periods of sufficient length were used. Oxidase activity was stimulated by very short, soda, mixed, and hot-water dips. Sulfuring decreased the oxidase activity approximately in proportion to the period of exposure and concentration of SO_2 used during sulfuring. Raisins prepared by dehydration had about one-fifth the oxidase activity of sulfured grapes dried in the shade, probably because of the relatively high temperature used for dehydration. The reduction of oxidase activity by some of the commercial dipping treatments may account for the production of light-colored raisins without the use of SO_2 .

Some factors affecting the burning of sulfurs used in sulfuring fruits. C. S. BISSEON, H. W. ALLINGER, and H. A. YOUNG (*Hilgardia* [California Sta.], 14 (1942), No. 6, pp. 361-372, figs. 7).—Small amounts of inorganic materials, such as dust and iron oxide, have practically no reducing effect on the percentage of sulfur burned. Carbon or carbonaceous matter appeared to originate from the interaction of molten sulfur or hot sulfur vapors, with traces of certain organic impurities. Of the widely varying materials tested, the petroleum oils and turpentine produced the most film and also showed the greatest reduction of sulfur burned, whereas cellulose materials had the least effect. Under field conditions the percentage of burning of contaminated sulfur was considerably less than in the laboratory, a decrease probably due to the limited access of air and the accumulation of sulfur dioxide in the sulfur chamber. Sulfur stored

from 2 to 6 days in an atmosphere of vapors arising from fuel oil absorbed sufficient volatile carbon compounds to increase the black film formation and decrease the quantity of sulfur burned. Raising the temperature of the sulfur container will almost completely burn a contaminated sulfur.

AGRICULTURAL METEOROLOGY

Measurement of evaporation from land and water surfaces, C. W. THORNTHWAITE and B. HOLZMAN (*U. S. Dept. Agr., Tech. Bul. 817 (1942), pp. [1]+143, figs. 22*).—This study attempts to satisfy the need for a method for determining water losses to the atmosphere from land surfaces with different types of plant cover as well as from free-water surfaces. Since the water entering the air becomes a gas and is invisible, direct methods like those for measuring precipitation or run-off in streams cannot be employed. Recent studies of turbulence at lower levels of the air have supplied essential information enabling the determination of the rate of moisture transfer from a natural surface into the air. An equation was accordingly developed that gives this rate of moisture transfer in terms of measurements of wind velocity and humidity at two levels directly above the surface. These measurements must be highly accurate. Thus a careful study of various types of hygrometers and anemometers was made and some new instruments were designed and tested, including a salt hygrometer, a chemical-absorption hygrometer, and a dew-point recorder, which are described. An evaporation station was established over a meadow at the Experimental Farm, Arlington, Va., in late fall, 1938, and operated through the following year, where a nearly complete hourly record of evaporation and condensation was obtained. The tables presented include hourly values of temperature and of specific humidity at two levels and hourly values of wind movement at four levels. They also include daily totals of condensation and evaporation, said to be the only records of this kind ever made. There are 181 references.

Precipitation in the Muskingum River Basin, [January–December 1941] (*U. S. Dept. Agr., Soil Conserv. Serv., 1941, pp. 63, figs. 21; pp. 48, figs. 17; pp. 62, figs. 20; pp. 49, figs. 18; pp. 61, figs. 19; pp. 69, figs. 22; 1942, pp. 74, figs. 25; pp. 46, figs. 15; pp. 42, figs. 14; pp. 65, figs. 21; pp. 48, figs. 15; pp. 52, figs. 20*).—Monthly records and charts are presented.

Verifying weather forecasts, H. H. CLAYTON (*Amer. Met. Soc. Bul., 22 (1941), No. 8, pp. 314–315*).—A formula for verifying weather forecasts is presented and discussed.

Relation of weather and its distribution to corn yields, F. E. DAVIS and G. D. HARRELL. (Coop. Iowa State Col.). (*U. S. Dept. Agr., Tech. Bul. 806 (1941), pp. 67, figs. 5*).—Maximum temperatures average too high for corn under the moisture conditions at Manhattan, Kans., Lincoln, Nebr., Columbia, Mo., Urbana, Ill., Wooster, Ohio, State College, Pa., and College Park, Md. The effect of maxima above the average was more pronounced at locations with the highest average seasonal temperature. Maxima above the average in both July and August were detrimental from one extreme of the Corn Belt to the other, but (except for Urbana, Ill.) above-average temperatures in May were beneficial to corn. Of the two weather factors, maximum temperature seemed to be the more dominant in its effect on corn yields, though at least part of the beneficial effect of additional rainfall was due to the associated effects of the accompanying lower temperature. Field optima of maximum temperature for corn at the locations studied ranged from 77° F. at Lincoln, Nebr., to 85° at Columbia, Mo. Although these optima are apparently related to the amount of early-season rainfall, some differences are to be expected among locations because of sampling errors.

A comparison of the effect of the amount and distribution of rainfall on the same corn variety grown under divergent conditions of culture at Wooster, Ohio, indicated that the effect differs markedly between high- and low-yielding series. Because of this fact and due to different practices in the several localities, differences in curves cannot be ascribed entirely to location and the rainfall identified with it. Average rainfall appears sufficient for corn in Iowa, probably because of the water-storing capacity of the soil. When the results for Maryland, Pennsylvania, and Iowa (not significant) were omitted, the rainfall regression formula alone accounted for a portion of the total variance of yield ranging from 22 percent at Wooster to 66 percent at Manhattan. The temperature regression formula alone accounted for a portion of the total variance of yield ranging from 24 percent at State College, Pa., to 81 percent at Manhattan. The seasonal distribution of rainfall and maximum temperature proved important for most of the locations studied. Continuous curves were obtained that show for any time during the season the average effect of deviations of rainfall and maximum temperature from the normal for that period. These facilitated biological interpretations of weather-yield relationships as within a season and as between locations, and also appeared superior to ordinary regression expressions. It is concluded that weather data collected through the entire growing season can be utilized.

Further study in relationship between fruit and air temperatures, P. J. POWELL (*Amer. Met. Soc. Bul.*, 23 (1942), No. 1, pp. 16-21, figs. 7).—From the results of a season's study in Florida it was found that with a fast drop in air temperature the fruit temperature tends to parallel it closely, but with slowly falling or stationary temperature that of the fruit invariably drops lower than the air temperature except occasionally when freezing of the fruit has already begun. On dry nights, exposed oranges tend to maintain a temperature as much as 3° F. or more lower than a stationary or slowly falling air temperature. On nights when dew or frost forms on the fruit, this temperature difference is usually reduced to 1°-2°. The factors believed responsible for this radically different characteristic of Florida as compared to California oranges are the thinner rind and the greater amount of moisture in the rind of the former. The proper use of fruit thermometers provides the best index in scientific grove heating. On nights of dry cold, unshielded fruit thermometer records are representative of true grove conditions, but it appears from experimental data that to obtain reliable records on nights when the dewpoint temperature is high and frost forms, the puncture in the fruit made by the thermometer must be sealed with petroleum jelly (etc.) to prevent frost particles from coming in contact with the fruit juice at this point, otherwise premature crystallization in the fruit will occur.

The influence of climate on seed production in Douglas fir, J. ROESER, JR. (U. S. D. A.). (*Jour. Forestry*, 40 (1942), No. 4, pp. 304-307).—Annual observations (1924-35) on 23 Douglas fir trees at various elevations (6,750-9,455 ft.) throughout its range of distribution on the east slope of Pikes Peak indicated that weather conditions at flowering time in spring influence flower production. Under favorable conditions, accompanied by a paucity of freezing weather in spring, the normal percentage of setting was about 90 percent. Most of the loss occurred during the early formative period when pollination and fertilization take place, and less in summer after fertilization has been accomplished. Flowers were most susceptible to freezing at the time of bursting from the buds, but they were apparently at no time immune if freezing temperatures prevailed over a protracted period and were accompanied by snow. Severe hailstorms during the flowering stage may also be destructive. Exceptional combina-

tions of weather conditions may result in heavy spring losses to both fruit and leaf buds. There is apparently a close synchronization of pistillate and staminate flower production. Pollination failures are most likely to be associated with wet weather. The possibility of complete cone crop failures over extensive areas appears very remote in view of the prolificacy in flower production, but this does not necessarily apply to the seed crop. A certain periodicity in flower formation exists which suggests a dependence on the readiness to form fruit and therefore rests on a physiological basis. To a large extent, however, physical factors control the course and trend of fruit development, directly by destroying the flowers and preventing pollination and indirectly by inhibiting normal vegetative processes and limiting flower bud production.

SOILS—FERTILIZERS

The soil scientist looks ahead, F. E. BEAR. (N. J. Expt. Stas.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 2, pp. 117-122).—This discussion emphasizes the importance of practical agricultural results from experimentation. Illustrating this point of view there are listed 20 practical problems in more or less urgent need of prompt solution.

[Soil investigations by the New Jersey Stations] (*New Jersey Stas. Rpt. 1941*, pp. 18-19, 73-75, 76-81, pl. 1).—Effect of lime on increase in soil moisture supply on permanent pastures; fertilizers popular in New Jersey; increase in consumption of liming materials; times of year when the greatest penetration of liming materials can be obtained; lack of *Azotobacter* activity in New Jersey soils; how phosphates should be applied for best results; variation in phosphate fixation among New Jersey soils; zinc content of New Jersey soils and the need for this element; influence of the oxygen supply about the roots on the comparative absorption and utilization of nitrate and ammonium nitrogen by plants; importance of an adequate phosphorus supply to the utilization of nitrate nitrogen by plants; value of plastic wastes as fertilizers; effects of the copper, lead, and arsenic falling on the soil as sprays; effect of antiseptics, such as sodium cyanide, on soil processes; measurement of the moisture supply near the roots of plants; persistence of drought effects; use of the soil conservation program too complicated on the average New Jersey farm; persistence of the effects of manure on soils; influence of organic matter on soil erosion; conservation of the soil by manure and cover crops; effectiveness of winter vetch as a green manure; place of terracing in erosion control; practical value of contour strips for New Jersey farms; inoculation of legumes grown in New Jersey soils with bacteria; effect of microbial antagonists on disease-producing germs; practical importance of acids produced by soil microbes; and importance of actinomycetes in soil processes are briefly noted.

[Soil investigations by the South Carolina Station] (*South Carolina Sta. Rpt. 1941*, pp. 40-42, 138, 139-140, 148, 149).—Conservation of soil through the proper utilization of organic matter is reported upon by T. C. Peele (coop. U. S. D. A.) and lysimeter investigations on effect of winter cover crops on percolation and nutrient losses by E. M. Roller and N. McKaig, Jr. A soil fertility investigation is also noted.

[Soil investigations by the Tennessee Station] (*Tennessee Sta. Rpt. 1940*, pp. 10-13, 60-70).—The following topics are reported upon: Truck crop erosion project, by N. D. Peacock; density method for determination of soil content of run-off and soil moisture and calibration of small-fraction run-off divisors, both by K. B. Sanders and A. L. Kennedy; and calcium-magnesium studies, lime-potash studies, lime-phosphate studies, sulfate recovery studies, nitrogen avail-

ability studies, determination of exchangeable bases, and new phosphorus fertilizers, by W. H. MacIntire and W. M. Shaw.

[**Soil investigations by the Washington Station**]. (Partly coop. U. S. D. A. et al.). (*Washington Sta. Bul.* 410 (1941), pp. 20-26, 39, 111-112, 113, 122-124).—Fertility investigations of Washington soils are noted by L. C. Wheating, S. C. Vandecaveye, and C. O. Stanberry; the maintenance of organic matter in eastern Washington soils, by Vandecaveye, Wheating, and L. T. Kardos; plant composition as influenced by fertilizers and soil type, by Vandecaveye and L. E. Dunn; fertility investigations of greenhouse soils, by Wheating and Stanberry; changes occurring in irrigated soils in the Wenatchee and Yakima Valleys as a result of irrigation and fertilizer treatments, by Vandecaveye and Wheating; utilization of fertilizers on representative upland soils in western Washington, by Wheating, Vandecaveye, and Stanberry; investigations of the causes and remedies of the unproductiveness of certain soils following the removal of mature trees, by Kardos, Vandecaveye, and N. Benson; fertility of irrigated soils, by Vandecaveye, Wheating, and H. P. Singleton; the maintenance of organic matter in central Washington soils, by Wheating, Vandecaveye, and V. T. Smith; the value of liquefied manure for pastures, by R. E. Hodgson, F. B. Wolberg, J. C. Knott, K. Baur, V. L. Miller, and U. S. Ashworth; reclamation of alkali soil, by C. A. Larson; time and amount of irrigation, by H. G. Nickle and Singleton; and control of erosion of soil by irrigation water, by Nickle. From the Soil Conservation Substation studies of soil erodibility, effect of plant cover on run-off and erosion, and relation of cropping practices to erosion control are dealt with by G. M. Horner; and tillage practices for erosion control and run-off from agricultural watersheds, both by Horner and L. M. Naffziger.

[**Soil Survey Reports, 1936 Series**] (*U. S. Dept. Agr., Bur. Plant Indus. [Soil Survey Rpts.]*, Ser. 1936, Nos. 8, pp. 503, pl. 1, figs. 144, maps 6; 10, pp. 61, pls. 2, figs. 2, map 1).—These surveys were made in cooperation with the Puerto Rico University and Texas Experiment Stations, respectively: No. 8, Puerto Rico, R. C. Roberts; and No. 10, Maverick County, Tex., H. M. Smith et al.

Effects of irrigation and cropping on soil profiles of desert soils (*New Mexico Sta. Rpt.* 1941, pp. 62-63).—Soil response to irrigation water of varying quality was studied in the profiles of virgin and irrigated soils in four localities.

Soil movement within the surface profile of terraced lands, A. W. ZINGA. (U. S. D. A. coop. Mo. Expt. Sta.). (*Agr. Engin.*, 23 (1942), No. 3, pp. 93-94, fig. 1).—In an investigation of soil movement on and from three terraced fields during periods of 7 or 8 yr., the author assembled composite data for three or four terrace profiles in each field. A marked parallelism among the surface profile changes in these fields was found. Soil loss in run-off, as measured at the ends of the terrace channels, represented only a small portion of the soil movement to the terrace channels. Soil was found to have been transferred from a terrace interval above to a lower adjacent interval by progression of the ridge location up the slope. The amount of such interchange approximated soil loss from the end of the terrace channel. Present cropping practices and farming methods were found to lead to benching between ridges. The undesirability of this formation on Shelby and similar soils is shown, and possible corrective measures are discussed.

Improved row system for terraced fields, T. L. COPLEY. (U. S. D. A.). (*Agr. Engin.*, 23 (1942), No. 3, pp. 95-96, figs. 3).—When there is reversal of grade in the rows, heavy rains cause break-through at the low point with serious erosion damage. The author points out that to avoid such grade reversal, the rows must parallel the upper terrace in sections of the interval narrowing toward the outlet and parallel the lower terrace in sections widening toward the outlet.

Theoretically, the grade of all rows then will equal or exceed the grade of the terraces. Observations show that this method works under field conditions. Revision of the row lay-out in accordance with this principle was found to be satisfactory in practice, except where small gullies or other abrupt changes in the topography interfere.

Soil defense in Oklahoma: A bibliography of soil conservation publications, K. DRAKE (*Oklahoma Sta. Cir. 97 (1942), pp. 16*).—This is a bibliography of publications pertaining to conservation problems found in Oklahoma. The list is limited to material available for free distribution or at a very small cost and of practical value to the farmer or to those trying to promote a conservation program.

Auxins in some American soils, W. S. STEWART and M. S. ANDERSON. (U. S. D. A.). (*Bot. Gaz., 103 (1942), No. 3, pp. 570-575*).—In the proximate method for extraction and assay described, 100 gm. of soil are shaken at intervals for 48 hr. with sufficient limewater to keep the pH at 7-8 in a volume of 400 cc. The filtered extract is then concentrated and auxin measured by the standard *Avena* test. Auxin determinations were made on the two upper horizons of 11 virgin soils representative of four of the great soil groups. In very fertile midwestern surface soils and subsoils auxin was found to the extent of about 0.175 μg . per kilogram of soil (indoleacetic acid equivalents.) In less fertile soils considerably less was found in the surface horizons and little if any in the second horizon. There are 20 references.

Inspection of legume inoculants, H. R. KRAYBILL, D. M. DOTY, C. W. HUGHES, and A. S. CARTER (*Indiana Sta. Cir. 269 (1941), pp. 4*).—Results of greenhouse tests, now required by State law, showed a very large proportion of the samples of legume inoculant preparations to be satisfactory, seven growth-promoting preparations containing vitamin B₁ to be without apparent value, and five samples of plant hormone preparations to be effective in increasing the extent of rooting in the cuttings.

Soil fertility studies in the Piedmont.—I, The effects of limestone and fertilizers in a 4-year rotation, C. B. WILLIAMS, W. H. RANKIN, and J. W. HENDRICKS (*North Carolina Sta. Bul. 331 (1942), pp. 36, figs. 7*).—Fertility plot experiments of the usual type carried out at the Piedmont Substation are reported upon in some detail. In a rotation of corn, wheat, clover, and cotton, limestone was the first essential to the production of crops in this rotation. Additions of nitrogen, phosphoric acid, and potash, along with limestone, were necessary to give the highest yields per acre. Next to limestone, phosphate gave the largest single-treatment crop increases. Potassic fertilizers alone, without limestone, caused a decrease in the yield of all crops, but on the limed soil potassium gave a larger increase in the yield of seed cotton than did either phosphate or nitrogen alone. Nitrogen was more important than potash in wheat production. Alone, nitrogen was never very profitable.

The influence of a 3-year rotation and fertilizer treatments on the organic carbon of soils, W. H. COATES (*New Hampshire Sta. Sci. Contrib. 81 [1941], pp. 19-26, fig. 1*).—This is a reprint from another source (*E. S. R., 84, p. 614*).

Fate of fertilizer when applied to soil, R. COLEMAN (*Miss. Farm Res. [Mississippi Sta.], 5 (1942) No. 4, p. 7*).—According to this brief popular statement of the more elementary known facts concerning the behavior of fertilizers in soils, most of the phosphate and much of the potassium applied will be retained and may benefit the crop of a succeeding season, but all nitrogen applied this year will be gone before next spring. A liberal application of lime should supply calcium to crops for several years.

Field tests of the relative effectiveness of different phosphate fertilizers, G. ROBERTS, J. F. FREEMAN, and H. MILLER (*Kentucky Sta. Bul.* 420 (1942), pp. 32, figs. 2).—On these tests, made in cooperation with the T. V. A., there were no significant differences in the effectiveness, on unlimed land, of ordinary superphosphate, triple superphosphate, dicalcium phosphate, and tricalcium phosphate. The average effectiveness of tricalcium phosphate on corn and wheat was slightly below that of the other forms mentioned. On limed ground in the standard tests the effectiveness of tricalcium phosphate was considerably less on corn and wheat than that of the other forms of phosphate, but not on hay. While there was not an appreciably greater increase from the phosphates for corn and wheat on limed soil than on unlimed soil, the total yields on the limed soil were considerably higher. Limestone not only increased the total yields of hay, as compared with unlimed soil, but significantly increased the effectiveness of the phosphates on hay. In the average of all tests on unlimed ground, calcium metaphosphate was somewhat more effective than triple superphosphate. On limed land there was little difference. Fused rock phosphate did not differ much from calcium metaphosphate, all crops considered. Results on individual soil types varied considerably from the averages of tests at all locations.

The influence of certain factors on removal of fluorine from superphosphates, W. H. MACINTIRE, L. J. HARDIN, and J. W. HAMMOND. (Tenn. Expt. Sta. et al.). (*Jour. Assoc. Off. Agr. Chem.*, 24 (1941), No. 2, pp. 477-489).—Heat treatments of superphosphates at 600° and 300° C. induced almost complete removal of fluorine but were accompanied by extensive transformations of phosphates into much less soluble forms. At 200° fluorine removal was increased by extension of the heating period and by stirring and granulation; no supplemental material, other than silica, accelerated fluorine removal; iron content exerted a repressive effect upon the volatilization of fluorine; this repressive effect was not diminished in superphosphates derived from rock phosphates ignited in air; almost no increase in citrate-insoluble phosphates occurred; and as much as 50-percent transition of the water-soluble orthophosphates to water-soluble meta forms was induced. The ignition of brown rock decreased the speed of acidulation. Prior ignition of brown rock phosphate at 1000° in an atmosphere of steam also decreased reactivity during acidulation, but caused a loss of more than 40 percent of the fluorine content of the rock and gave a bleached calcine that yielded a white superphosphate. Acidulations with 78 percent H_3PO_4 were more effective than those with 70 percent acid, regardless of temperature of rock and acid. A 10-percent replacement of H_3PO_4 by H_2SO_4 caused a deliquescence when the heated superphosphates were ground and exposed.

Relation of exchangeable potassium in Alabama soils to needs of the cotton crop, N. J. VOLK. (Ala. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 2, pp. 188-198, figs. 2).—From the combined results of numerous fertilizer tests, the author concludes that about 95 percent of all soils studied responded significantly to the first increment (25 lb. per acre of K_2O) of applied potash and about 40 to 50 percent responded significantly to the second increment. For soils of the same type containing less than about 200 lb. of exchangeable potash per acre, there is a general relationship between the total yield of seed cotton and the total exchangeable potash contained in the soil. Soils which contained over 200 lb. of exchangeable potash per acre frequently responded to an application of potash, however. It is thought that predictions of the need of the cotton plant for a second increment of potash, based on a knowledge of the texture, series, and exchangeable potash content of the soils, will be

unreliable in about 35 percent of the cases. It is believed that differences in response to like quantities of potash are caused by differences in soil characteristics which may greatly influence the yield of cotton, and if possible these should be taken into consideration in making fertilizer recommendations on the basis of soil analysis.

Preliminary experiments on boron requirement on some crops, M. T. VITRUM. ([Conn.] Storrs Expt. Sta.). (*Conn. Veg. Growers' Assoc. Rpt., 1940, pp. 80-83*).—This is a brief review of the subject, with notes on preliminary tests with various field and truck crops.

Manganese status of some important Ohio soil types and uptake of manganese by Kentucky bluegrass, M. H. McVICKAR. (Ohio State Univ. et al.). (*Jour. Amer. Soc. Agron., 34 (1942), No. 2, pp. 123-128*).—In general the more highly leached soils were lower in all forms of manganese, but Clermont silt loam, a highly leached soil, showed a total and replaceable manganese content much higher than that of the comparable Blanchester silt loam. This is attributed to an accumulation of manganese in concretions, a recognized feature of the Clermont silt loam profile. The nature of the parent material could not be used as an index of the manganese content of a soil. Grass grown on Miami silty clay loam carried the lowest manganese content, but the soil on which it was grown showed the second lowest total manganese, fourth lowest replaceable manganese, second lowest manganese dioxide, and lowest available manganese content. Likewise, Trumbull silty clay loam was second in manganese content of grass, highest in total and replaceable manganese, third in manganese dioxide, and highest in available manganese. On the contrary, Clermont silt loam carried the highest manganese content in grass, third lowest in total, second highest in replaceable, lowest in manganese dioxide, and near average in available manganese. The manganese uptake in parts per million by bluegrass on soils below pH 5.0 averaged 7.68 as compared with 1.84 on soils of pH 5.0 or above. Aeration, as associated with drainage, influenced the manganese uptake. Bluegrass growing on poorly drained soils low in organic matter contained, as an average, 10.33 p. p. m. of manganese, while that from poorly drained dark-colored soils, high in organic matter, contained 2.00 p. p. m.

The farmer's fertilizer handbook, L. C. WHEETING, E. L. OVERHOLSER, and S. C. VANDECAVEYE (*Washington Sta. Pop. Bul. 165 (1942), pp. [15]*).—This bulletin summarizes, in terms of 100-lb. bags per acre of fertilizer of specified NPK composition for specified sections of the State and for stated supplementary treatment of the soil, information concerning the profitable use of commercial fertilizers available for the State of Washington. Prominent place is given to the cautionary statements that economic returns from fertilizers are not easily obtained on soils that are naturally very productive; that fertilizers will not be found useful in overcoming conditions of poor drainage, low water-holding capacity, low-quality seed, and other similar limiting factors in production; that seasonal variation in available moisture supply and the kind of crop are important considerations; etc. In general, in Washington economic returns from commercial fertilizers have not been obtained on crops of low unit value. The recommendations are tabulated separately for vegetable crops, fruit crops, cereal hays and small grains, and row crops, pasture, and hay. For each of these classes the State is divided into the two sections designated eastern Washington and western Washington. Soils of each of these sections are separated into irrigated and nonirrigated lands, and each of these in turn is subdivided under the two heads with 8-10 tons manure and without manure. The general crop classes of the four tables are each broken down into sub-

classes, and specific fertilizer recommendation is given, with occasional omissions, for each of the eight land classes indicated and with reference to one general type of previous crop.

Buying fertilizers wisely, L. D. HAIGH and W. A. ALBRECHT (*Missouri Sta. Cir.* 227 (1942), pp. 8, figs. 4).—This is a brief popular discussion of the nature of commercial fertilizers, considerations affecting their purchase, and the functioning of the fertilizer law.

More effective use of fertilizers, F. E. BEAR (*New Jersey Stat. Cir.* 429 (1942), pp. [4]).—This is a brief popular summary of sound fertilizer and soil maintenance practice, emphasizing calcium supply to induce deep rooting, use of legumes to build up soil organic matter, proper fertilizer placement, use of high-analysis fertilizers, etc.

Inspection of commercial fertilizers for 1941, T. O. SMITH and H. A. DAVIS (*New Hampshire Sta. Bul.* 336 (1941), pp. [1]+11).—In addition to purely analytical data, this bulletin contains a table of complete fertilizers of 30 formula compositions with their average actual compositions and average price per ton.

AGRICULTURAL BOTANY

Flowering plants and ferns of Arizona, T. H. KEARNEY and R. H. PEEBLES (*U. S. Dept. Agr., Misc. Pub.* 423 (1942), pp. [1]+1069, pls. 30, fig. 1).—Approximately 3,200 flowering plant and fern species, growing without cultivation, are known to occur in Arizona, and since much of its area has not yet been thoroughly explored it is believed that eventually not less than 3,500 will be found. The number of families of flowering plants represented in this flora is 121, besides 7 families of ferns and fern allies. The leading 10 families are mainly those occupying this rank in other North American local floras and, to a large extent, in all temperate parts of the Northern Hemisphere. The outstanding exception is the Cactaceae. It is said that no other State, save Texas, has so rich a representation of this group, and 11 of the 76 known species in Arizona have not hitherto been found outside its borders. Keys to the families, genera, and species, and brief descriptions of the families and genera, are provided. Under each species are given the essential synonymy, the geographical and altitudinal range within the State, habitat, time of flowering, and general geographical distribution. Notes are given on economically important plants as to their value for timber, forage, soil conservation, medicine, and utilization by the Indians. Introductory chapters deal with the history of botanical explorations in Arizona, geographical relationships of the flora, and types of vegetation, the last contributed by F. Shreve of the Carnegie Institution of Washington. Certain critical families and genera have been treated by 23 collaborators.

Plant hunters in the Andes, T. H. GOODSPEED (*New York and Toronto: Farrar and Rinehart*, [1941], pp. XVI+429, [pls. 78]).—"In this book some of the Peruvian and Chilean accomplishments and experiences of members of two plant hunting expeditions sent out by the University of California Botanical Garden are described."

[Botanical studies] (*Amer. Chem. Soc. Mtg.*, 102 (1941), *Abstr. Papers*, pp. 14A, 15A-16A, 17A, 18A-19A).—The following are of interest: The Newer Applications of Plant Hormones, by F. D. Jones (p. 14A); The Effect of Waste Sulfite Liquor From Wood Pulp Industry on Soil Properties and Plant Growth, by W. E. Caldwell, J. B. Spulnik, and A. Vane (p. 15A) (Oreg. State Col.); The Oxidation Enzymes of the Mushroom Studied by Cultural Methods, by B. B. Stoller (pp. 15A-16A); A Comparison of Methods for the Determination of Moisture in Tobacco, by C. W. Woodmansee, K. E. Rupp, Jr., and J. S. Mc-

Hargue (p. 17A) (Ky. Expt. Sta.); and A Comparison of the Consistency and Microscopical Properties of Some Kansas Starches, by H. N. Barham, J. A. Wagoner, B. M. Williams, and G. N. Reed (pp. 18A-19A).

Phyllanthus nummulariaefolius Poir. in the United States, L. CROIZAT (Torreya, 42 (1942), No. 1, pp. 14-17).—Notes on the presence of this noxious weed from Latin America in the United States.

The lethal effect of drier rolls upon bacteria, J. W. APPLING and B. F. SHEMA (Paper Trade Jour., 114 (1942), No. 13, pp. 40-44, figs. 4).—When the wet web of a Fourdrinier machine was inoculated with *Escherichia coli*, *Serratia marcescens*, *Staphylococcus aureus*, *Acrobacter acrogenes*, and with mixed suspensions of the first three nonsporiferous species in addition to *Bacillus mycoides*, it was found that only the last (a spore-former) survived the drier rolls. Large numbers of bacteria were found in both top and bottom liners when made from highly contaminated stock, such as waste paper. The drier rolls did not have sufficient lethal effect to sterilize such stock, although heated by direct contact with the rolls. The extraordinary resistance of spore-formers to moist heat in vitro and in paperboard pointed to the conclusions that they are capable of surviving a much longer exposure to moist heat in paperboard than in vitro; that their resistance to heat in vitro is often too great for expectation of sterility within the practical time limits used on drier rolls, that their resistance in paperboards is too great to obtain a product of bacterial content lower than 250 per gram if relatively large numbers are present in the wet web, and that the heat resistance of a bacterial species isolated from paperboard may be much greater than that usually obtaining for the species.

Streptothricin, a new selective bacteriostatic and bactericidal agent, particularly active against gram-negative bacteria, S. A. WAKSMAN and H. B. WOODRUFF. (N. J. Expt. Sta.). (Soc. Expt. Biol. and Med. Proc., 49 (1942), No. 2, pp. 207-210).—The new substance seems to be formed from certain amino acids in the medium. Its preparation and properties are described, the latter being those of an organic base. Addition of 0.1 mg. of crude material to 10 cc. of nutrient agar inhibited the growth of *Escherichia coli* and various other gram-negative bacteria. Among the gram-positive forms some, like *Bacillus subtilis* and micrococci, were more sensitive, whereas others, like *B. mycoides*, were far more resistant. Streptothricin possesses also marked bactericidal properties, especially against certain gram-negative bacteria.

Inhibition of micro-organisms by a toxic substance produced by an aerobic spore-forming bacillus, H. KATZNELSON. (Rutgers and Cornell Univs. et al.). (Canad. Jour. Res., 20 (1942), No. 3, Sect. C, pp. 169-173).—A thermostable diffusible substance produced by this bacillus in a potato dextrose peptone medium (described) inhibited growth of 77 out of 81 species of parasitic and saprophytic fungi. Actinomycetes were more tolerant than fungi, though some were fully inhibited. The majority of streptococci, staphylococci, bacilli, lactobacilli, and clostridia tested were suppressed by the toxic medium, but gram-negative organisms were unaffected. *Bacillus subtilis*, and to some extent *B. cereus* and *B. pumilis*, produced thermostable substances toxic to *Rhizoctonia solani*. Soil, bentonite, and activated charcoal completely adsorbed the toxic agent, agar was less effective, and talc not at all. Its properties are presented in detail so far as ascertained, but it has not yet been identified.

Assimilation of heavy carbon dioxide by heterotrophic bacteria, H. D. SLADE, H. G. WOOD, A. O. NIER, A. HEMINGWAY, and C. H. WEBKMAN. (Iowa Expt. Sta. and Univ. Minn.). (Jour. Biol. Chem., 143 (1942), No. 1, pp. 133-145).—It is shown by use of heavy C (C^{14}) as a tracer that the fixed C is located in the carboxyl groups of succinic, lactic, and acetic acids, and the assimilated

CO₂ is distributed as follows: *Aerobacter indologenes*, acetate, lactate, and succinate; *Proteus vulgaris*, *Streptococcus paracitrovorus*, and *Staphylococcus candidus*, lactate and succinate; *Clostridium welchii*, acetate and lactate; *C. acetobutylicum*, lactate. Succinic acid contained fixed C in every case where it was formed. Fixation of CO₂ in succinic acid is believed to arise by C₂ and C₁ addition according to the Wood and Werkman reaction (E. S. R., 80, p. 167). Conversely, lactate and acetate did not contain fixed C in all cases. Thus there appear to be fundamental differences in the mechanism of formation of these compounds among the heterotrophic bacteria, and possible mechanisms are discussed. There are 28 references.

***Clostridium kluyverii*, an organism concerned in the formation of caproic acid from ethyl alcohol**, H. A. BARKER and S. M. TAIHA. (Univ. Calif.). (*Jour. Bact.*, 43 (1942), No. 3, pp. 347-363, figs. 5).—Nine strains of this new species isolated from fresh water and marine muds were studied.

***Clostridium acidi-uridi* and *Clostridium cylindrosporum*, organisms fermenting uric acid and some other purines**, H. A. BARKER and J. V. BECK. (Univ. Calif.). (*Jour. Bact.*, 43 (1942), No. 3, pp. 291-304, figs. 4).—These two new species were isolated from the soil.

Adaptability of silica gel as a culture medium, A. J. STERGES. (Tex. Expt. Sta.). (*Jour. Bact.*, 43 (1942), No. 3, pp. 317-327, fig. 1).—A satisfactory silica gel medium for isolating nitrifying micro-organisms was developed by standardizing the reagents, incorporation of the nutrients directly with the acid reagent, construction of a special apparatus which prevented contamination of the medium while mixing the reagents, and elimination of the process of dialyzing the gels. Details are given.

A study of the nuclear apparatus of bacteria, C. F. ROBINOW (*Roy. Soc. [London]*, *Proc.*, Ser. B, 130 (1942), No. 860, pp. 299-324, pls. 4, fig. 1).—The structural unit of the nuclear apparatus of aerobic, sporiferous bacteria (five species studied) was found to be a dumbbell-shaped body, giving a positive Feulgen reaction and possessing a strong affinity for nuclear dyes. Details are given and illustrated for different life history stages, and similar bodies were demonstrated in the cells of *Proteus vulgaris* and *Sarcina* spp. The two single Feulgen-positive bodies described by previous authors (51 references) are believed to consist of two pairs of dumbbell bodies, and the single "cells" to which they refer are considered to be two-celled filaments. It is concluded that the dumbbell bodies are comparable to the chromosomes of plant and animal cells.

The demonstration of a nucleus in the cell of a staphylococcus, G. KNAYSIL (Cornell Univ.). (*Jour. Bact.*, 43 (1942), No. 3, pp. 365-385, pls. 2, fig. 1).—Granules believed, on both chemical and morphological grounds, to be nuclear in nature were demonstrated in the cells of a staphylococcus forming greenish-black colonies and spontaneously dissociating into a yellow strain. There are 21 references.

Mushroom poisoning caused by *Lactaria glaucescens*, V. K. CHARLES (*Mycologia*, 34 (1942), No. 1, pp. 112-113).

Studies in the biochemistry of micro-organisms.—69, Synthesis of cate-narin (1:4:5:7-tetrahydroxy-2-methylanthraquinone), a metabolic product of species of *Helminthosporium*, W. K. ANSLOW and H. RAISTRICK (*Biochem. Jour.*, 35 (1941), No. 8-9, pp. 1006-1010).—1,4,5,7-Tetrahydroxy-2-methylanthraquinone was synthesized and shown to be identical with natural catenarin, a metabolic product of *Helminthosporium* spp.

Composition of fungus hyphae.—III, The Pythiaceae, R. C. THOMAS. (Ohio Expt. Sta.). (*Ohio Jour. Sci.*, 42 (1942), No. 2, pp. 60-62).—Continuing this series (E. S. R., 63, p. 722), analyses were made of the mycellum of six *Pythium*

spp., and the same composition was revealed in all. The outer covering of young hyphae was found to be pectic in nature, and it could be removed by suitable solvents to disclose underneath a layer of cellulose. This pectic substance on the outside completely masked the cellulose and prevented reagents from reaching it. Old mature hyphae were doubly refractive to polarized light and therefore devoid of pectic substance on the outside. The cellulose was strongly impregnated with fatty acids which prevented the dye fixation, but these acids could be removed by saponifying with alcoholic potash. The residual or basic skeleton of the mycelium was identified as chitin.

Leguminosen en Rhizobia [Legumes and Rhizobia], P. DE JONGH (*Landbouw [Buitenzorg]*, 17 (1941), No. 8-10, pp. 844-859).

The growth of nodule bacteria in the expressed juices from legume roots bearing effective and ineffective nodules, H. K. CHEN, H. NICOL, and H. G. THORNTON (*Roy. Soc. [London], Proc., Ser. B*, 129 (1940), No. 857, pp. 475-491).—When strains of pea and soybean nodule bacteria differing in effectiveness of benefit to the host were grown in media containing the unheated root juices from uninoculated hosts and from those bearing effective and ineffective nodules, growth on root juice from uninoculated plants was not correlated with their effectiveness. Juice from roots with effective nodules produced significantly better growth of the bacteria than that from roots with ineffective nodules in 27 of 44 comparisons, differences in the remaining cases being insignificant. Juice from roots with effective nodules produced significantly better growth than that from uninoculated plants in 10 of 25 comparisons, and significantly poorer in 3 comparisons. Juice from roots with ineffective nodules produced significantly poorer growth than that from uninoculated plants in 11 of 25 comparisons, and better growth in only 1 comparison. It is concluded that production (resulting from infection) of soluble substances affecting the bacterial growth affords an explanation of those differences in nodule growth that determine the effectiveness or ineffectiveness of the different bacterial strains as regards N fixation within the host.

Effective and ineffective association between root-nodule bacteria and the host plant, J. M. VINCENT (*Nature [London]*, 148 (1941), No. 3750, pp. 315-316).—This is a criticism of a paper by Chen, Nicol, and Thornton, noted above, and a reply by Thornton.

The use of respiration methods in studying the physiology of legume root-nodule bacteria, D. W. THORNE and R. H. WALKER. (Utah State Agr. Col.). (*Utah Acad. Sci., Arts, and Letters, Proc.*, 17 (1939-40), p. 2).—An abstract.

Sur le molybdène des nodosités de légumineuses [Molybdenum in legume nodules], D. BERTRAND (*Compt. Rend Acad. Sci. [Paris]*, 211 (1940), No. 24, pp. 670-672).—The literature of the subject is briefly reviewed, and analyses are presented for six leguminous samples including broadbean, white lupine (inoculated and not inoculated), soybean, bean, and yellow lupine.

Vitamin deficiencies of *Ceratostomella*, W. J. ROBBINS and R. MA (*Bul. Torrey Bot. Club*, 69 (1942), No. 3, pp. 184-203, figs. 4).—When 10 *Ceratostomella* species or strains were grown in a basal mineral-dextrose medium containing asparagine and in the same medium supplemented with biotin, pyridoxine, or thiamin singly and in combination, all suffered from complete or partial vitamin deficiencies and 7 different combinations of deficiencies were found. The results show that the advantage of media containing natural products for culture of these fungi is probably due to the vitamins supplied by them. Some evidence is presented for the existence of deficiencies for unidentified vitamins. The presence of biotin, thiamin, and pyridoxine in cotton batting and in Difco agar was demonstrated.

Thiamin and growth of some species of *Pythium*, R. K. SAKSENA (*Indian Acad. Sci. Proc.*, 14 (1941), No. 2, Sect. B, pp. 141-148, pl. 1).—*P. arrhenomanes*, *P. deliense*, *P. graminicolum*, *P. hyphalostictum*, and *P. mamillatum*, when grown in a nutrient solution containing mineral salts and pure dextrose without appreciable amounts of thiamin (determined by test fungi requiring it), proved capable of unlimited growth, indicating that they can synthesize their own growth substance from the substrate. Some of the growth substance manufactured (probably thiamin) by the fungi was also given off into the medium. Addition of thiamin had no marked effect on growth. Concentration of medium was found to affect the synthesis of growth substance.

Riboflavin in isolated roots, J. BONNER (*Bot. Gaz.*, 103 (1942), No. 3, pp. 581-585).—The riboflavin contents of 1-cm. root tips from aseptically germinated seeds of tomato, alfalfa, clover, sunflower, and *Datura* were determined, and in each case a similar root tip or tips were cultured in vitro. Riboflavin determinations were done on isolated roots from the stocks thus established, the roots used for assay being bases from which 1-cm. apical tips had been removed and representing samples of the root tissue produced during each weekly culture period. The number of such bases which arose, during culture, from one initial seedling root was large. For *Datura*, over 1,000 were actually produced during 63 weeks of culture. With every species, each of these bases contained markedly more riboflavin than the initial root tip from which the root tip or clone had been derived. The data suggest that in all the species of isolated roots studied a synthesis of riboflavin had occurred during culture.

A straight-growth method of auxin determination in plants, E. D. BRAIN (*Nature [London]*, 148 (1941), No. 3761, pp. 666-667, fig. 1).—Although the procedure described cannot yield such exact quantitative results as the *Avena* test method, it is said to have proved useful under ordinary greenhouse conditions in comparative work and under more controlled conditions to have possibilities for finer quantitative estimations. By this upright-growth technique peas are grown in soil in pots and the growth of the internodes is recorded separately. The seedlings are then placed in a dark box at 100 percent relative humidity. After 24 hr. the growth of the separate internodes is recorded, and the peas are prepared for test by cutting off the part still actively growing and marking the height of the stump on a millimeter scale. After holding in the dark box until bleeding has ceased the cut stumps are covered with lanolin containing the test material. The cut plants are then returned to the dark box for 24 hr., removed, again measured on the millimeter scale, and the growth recorded. Further details are given.

Ascorbic acid system in barley, W. O. JAMES and J. M. CRAGG (*Nature [London]*, 148 (1941), No. 3763, pp. 726-727).—From this preliminary report of experimental results, there is good reason to presume the existence in barley tissues of a cellular reducing system capable of regenerating ascorbic acid from its oxidized form.

Effect of variations in light intensity, length of photo-period, and availability of nitrogen upon accumulation of ascorbic acid in cowpea plants, M. E. REID (U. S. D. A. et al.). (*Bul. Torrey Bot. Club*, 69 (1942), No. 3, pp. 204-220, figs. 3).—High daylight intensity and medium to long days proved conducive to both high absolute and percentage of ascorbic acid, whereas the reverse had a depressing effect. Seasonal variations attributable to differences in light conditions were found in the absolute and percentage contents of ascorbic acid. With differences in light intensity of 65 percent and in the light period with normal daylight of 42 percent, light intensity was found to have a greater influence than day length. Lengthening the day with weak light (Mazda) to 17 hr. so

as to produce an 80 percent increase in day length did not produce increases as great as a 65 percent increase in light intensity. Shifting ascorbic acid values were found as a result of environal alterations such as weather. When light conditions permitted an ample carbohydrate synthesis, a sufficient nutrient supply with special reference to N was also conducive to high ascorbic acid values. It is suggested that the relation of N to ascorbic acid formation in a green plant depends on its requirement for synthesis and maintenance of the plasma content of the chloroplasts. It is also suggested that weather conditions involving varying light intensities should be considered in determining the time for harvesting fruits and vegetables. There are 37 references.

Biotin as a growth factor for Rhizobia, J. B. and P. W. WILSON. (Univ. Wis.). (*Jour. Bact.*, 43 (1942), No. 3, pp. 329-341, figs. 3).—From use of synthetic media, containing salts purified by special technics described, on several species of *Rhizobium*, it is concluded that strains can be divided into three groups according to their biotin requirements, viz, (1) in its absence most strains grow very poorly and reach a population of about one-tenth the maximum, but continuous serial transfer is possible; (2) a few strains attain practically maximum growth in its absence; and (3) a few strains are unable to grow unless it is supplied.

Effect of phenylacetic acid and naphthalene acetamide on tomato plants grown in soil, M. E. HAMNER (*Bot. Gaz.*, 103 (1942), No. 3, pp. 576-580).—In studies to test the possible effects of these two growth substances on tomato plants grown in crocks in a native garden soil and also in another soil to which sand and CaCO_3 had been added, the results were similar to those obtained with quartz sand and various nutrient solutions, except that in no case were there increases in growth over that of controls. Even the most dilute concentration (10^{-30}) resulted in less growth. There were no clear direct indications that the physical texture, soluble salt content, or amount or type of organic material in these soils directly influenced the general effects of these two growth substances when supplied to tomato plants. The data do not at present support the rather general claim that the growth of plants is greatly increased when small amounts of either of these growth substances are added to the soil.

Root distribution and environment in a maple-oak forest, N. J. SCULLY (*Bot. Gaz.*, 103 (1942), No. 3, pp. 492-517, figs. 21).—With selection to obtain a cross section of the varying conditions, the relationship of the Bellefontaine silt loam soil profile with its inclusions to the root development of the native species in a maple-oak forest in Wisconsin was investigated (1938-40), 16 station types being studied by the trench method of root-distribution sampling, but with a new and more accurate square method of trenching used in 6 of them. The greatest concentration of the smallest roots was in the A_1 horizon, and larger roots did not show an increase in numbers per unit horizon surface below the A horizons. Greater numbers of dead roots occurred in lower horizons. On the root number and percentage root-area basis, horizons A_1 , A_2 , B_1 , and B_2 , and C_1 generally showed successive decrease in suitability for root development. On the same basis there were marked decreases (two exceptions) of root numbers and area with successive 1-ft. increases in depth to 3 ft. Areas with sparse ground cover had low root numbers and comparatively high percentage root areas. Stations with more abundant ground cover were characterized by larger root numbers and smaller percentage root areas. Earthworm and cicada activities proved important in the soil environment, and such activities were more or less uniform throughout the woodland. In all cubic-foot root-volume samples, the 0-8-in. level contained 80 percent or more of the total root volume present in the sample. When the sample lacked roots $> \frac{1}{2}$ in. in diameter, there were

successive decreases in volume in passing into the 0-4, 4-8, and 8-12-in. levels. There are 20 references.

Rol' temperatur'nogo gradienta v ontogeneze ovoshchnykh ratenii (The role of the temperature difference in the ontogenesis of vegetables), S. I. RADCHENKO (*Izv. Nauch. Inst. Lesgafta (Bul. Inst. Sci. Lesshaft)*, 23 (1940), pp. 137-158, fig. 1; *Eng. abs.*, pp. 157-158).—The author's investigations are said to confirm the previously established theoretical statement according to which higher plants are adapted to a negative temperature difference, i. e., to a condition under which the soil temperature is lower than that of the air. Using this principle, experiments were carried out on the growing of various vegetable seedlings in hotbeds for later transplantation and in adapting the hotbeds for best results, and are here detailed.

Culture of isolated roots of *Acacia melanoxylon*, J. BONNER (*Bul. Torrey Bot. Club*, 69 (1942), No. 2, pp. 130-133).—Isolated roots were cultivated for periods up to 35 weeks in fluid medium containing inorganic salts, 2 percent sucrose, and supplements of thiamin, pyridoxine, and nicotinic acid.

Viability of coconut seeds after floating in sea, C. H. EDMONDSON (*Bernice P. Bishop Mus. Occas. Papers*, 16 (1941), No. 12, pp. 293-304, figs. 3).—Coconuts were found capable of development after floating in the sea up to 110 days. While floating in the ocean the husk may absorb large amounts of sea water, but the seed is well adapted for its exclusion and the young shoot is apparently not seriously affected. Though changes in color and odor may occur within the floating nut, development may proceed regardless of these changes, and germination may begin and continue while the coconut floats in the sea. Excessive dryness may completely inhibit development after germination has begun.

Growth and development in range grasses.—II, Early development of *Bouteloua curtipendula* as affected by drought periods, C. E. OLMSTED (*Bot. Gaz.*, 103 (1942), No. 3, pp. 531-542).—Growing seedlings in 2-gal. crocks subjected to controlled drought conditions, the few which failed to survive the 48-hr. drought and many of the larger number failing to survive for longer periods had not established adventitious roots, either because of having been placed on drought prior to or just at the time of initiation of such roots or because infrequent watering had prevented their establishment. Such establishment seemed to depend on 3 consecutive days of soil-surface wetness. However, a number of small plants survived 48 days of drought with no established adventitious roots. All stem meristems nearest the ground, with the young foliage surrounding them, were equally and most resistant to the effects of internal water deficit, resuming growth rapidly after watering. Older foliage died during the 48-day drought period. Initiated adventitious root primordia buried in stem tissues either died or failed to grow effectively after subjection to 2-3 weeks of water deficit. Many root tips established in the soil had apparently survived but resumed growth very slowly after drought, in contrast to stem meristems. There was but little differential effect of drought at different ages on the growth produced by all stem meristems which survived. At 110 days, numerous growth measurements were correlated closely with the total amount of water supplied during the experiment. In general, size was reduced by drought to a greater degree than were numbers of organs differentiated (at least in the 48-day period) as compared with continuously watered controls. Drought, when it prevented establishment of adventitious roots, tended to stimulate the initiation of root primordia on the various axes, both by accelerating the rate of initiation and by increase in the total numbers produced on the axis after watering was resumed.

The dependence of certain annual plants on shrubs in southern California deserts, F. W. WENT (*Bul. Torrey Bot. Club*, 69 (1942), No. 2, pp. 100-114).—

Wherever lack of precipitation prevented a continuous cover of vegetation in southern California, the dependence of certain annuals on the presence of specific shrubs was evident. Other groups of annuals were not found to depend on shrubs or organic material for their growth, and many of these forms were found in great abundance in open spaces among the shrubs. The many species encountered and detailed analysis of the study by tables and discussion are presented.

Sur la répartition du bore parmi les espèces végétales [The distribution of boron among plant species] G. BERTRAND and L. SILBERSTEIN (*Compt. Rend. Acad. Sci. [Paris]*, 211 (1940), No. 24, pp. 624-625).—A note on the B distribution and requirements in relation to position in the systematic plant groups, and the significance of such findings in relation to agriculture, particularly in the grass family, the legumes, and the crucifers.

Anatomical and physiological responses of squash to various levels of born supply, T. R. ALEXANDER (*Bot. Gaz.* 103 (1942), No. 3, pp. 475-491, figs. 5).—In the tests reported, anatomical responses were evident in stem and root tips, second leaves, and stems 2 days after the B-deficient treatment was started. In the stem tips, cell enlargement and collapse occurred in the region of cell division and in the cortex of more mature parts. The stelar cells of the root tip were similarly affected. Tissues growing actively at the beginning of treatment were most responsive, but hypocotyls were very inactive. Hyper trophy of the xylem parenchyma and of that in the regions where internal and external cambiums usually originate was the first visible response in organs with differentiated vascular bundles. B-deficient organs exhibited increased catalase activity. Except for root tips, the greatest catalase activity was measured in the organs with the earliest and most extensive histological responses. These organs were also the ones which became chlorotic, and a possible correlation between this condition and extreme catalase activity is suggested. B-deficient plants soon lost their capacity for geotropic response, the first evidence of it being noted on the second day after treatment. There are 30 references.

Toxic effects of sodium pentachlorophenate and other chemicals on water hyacinth, A. A. HIRSCH (*Bot. Gaz.*, 103 (1942), No. 3, pp. 620-621).—This is a preliminary report on experiments designed to find a safe poison to control this water weed, in which the proprietary algacide and fungicide Santobrite gave most promising results.

On formative effects of carbohydrates on root growth, H. BURSTRÖM (*Bot. Notiser*, 1941, No. 3, pp. 310-334, figs. 3).—In studies of the epidermal cells of isolated wheat roots grown in solutions of different concentrations of glucose, cell division and elongation proved to be highly independent, the former being more constant than the latter. Without addition of glucose neither division nor elongation occurred. When glucose was added in increasing amounts up to $\frac{1}{100}$ mol/l. the rates of both cell division and elongation increased, which might have been due to the nutritive effect of the sugar. At additions above $\frac{1}{100}$ and up to $\frac{1}{10}$ mol the cell number remained constant but the roots increased in diameter, while a number of divisions of the dermatogen were laid down longitudinally instead of transversely. Thus the rate of division is independent of the direction of the plane of division. This effect is said to depend on the abundance of glucose itself rather than on the osmotic action of the solutions. In the same concentrations of glucose the formation of root hairs was promoted, including that in cells not initially determined as root hair cells. With additions of $\frac{1}{100}$ - $\frac{1}{10}$ mol of glucose the rate of elongation remained constant, but the time of elongation was extended. Thus the final length of the cells steadily increased with increasing glucose supply. This increase in time of elongation is connected with the

amount of osmotic substances available in the cells, and the mature cells obtain a constant turgor pressure corresponding to about 0.2 mol of glucose, irrespective of final cell size and external glucose concentration. The elasticity of the cell wall is not influenced by these conditions. There are 23 references.

Nitrate and carbohydrate reserves in relation to nitrogen nutrition of pineapple. G. T. NIGHTINGALE (*Bot. Gaz.*, 103 (1942), No. 3, pp. 409-456, pl. 1, figs. 13).—Methods are given for obtaining in the field quantitative records of plant weight, number and dimensions of leaves, and percentage deficiency (if any) of stored water in pineapple leaves, and details of other experimental procedures are presented. Macrochemical analyses for starch failed to indicate to what percentage of capacity the plants were supplied with it, since the relatively xeromorphic yellow-green plants contained such a high proportion of inert lignified elements that expression as percentage of fresh or dry material indicated relatively small amounts of starch. With respect to nitrate nutrition such a plant is not considered deficient in carbohydrates, even though the absolute amount may be low. In contrast, black-green, soft, succulent plants containing only about 25 percent of the starch which their tissues were potentially capable of storing actually had much more starch than the woody ones. With respect to nitrate nutrition, plants of this category are therefore considered deficient in carbohydrates even though the absolute amount is higher than in the case above noted. The degree of greenness of the leaves was found to reflect what percentage of the total capacity of starch reserves the plant possessed. By employing suitable color standards, the relative greenness, quantitatively recorded, supplied a sufficiently precise index of the carbohydrate content.

It is essential to maintain an adequate nitrate reserve in the plant. If the concentration is relatively low its reduction is not so efficiently or freely effected as when it is higher, and sufficient carbohydrates must be available for oxidation as nitrate is reduced. Plants allowed to accumulate a high carbohydrate reserve and to become temporarily deficient in nitrate, when again supplied with nitrate, apparently absorbed and reduced it much more vigorously than other plants continuously higher in nitrate and lower in carbohydrates. If at any time prior to emergence of flower buds nitrate reserves were deficient in relation to carbohydrates for any considerable time, yields of fruit were less than when the deficiency had been promptly corrected. Even when the nitrate concentration was extremely low and carbohydrates were also deficient, addition of N (whether or not it increased the nitrate reserve) did not result in materially increased yields.

There was some evidence that soil temperatures of 68° F. or lower result in limiting the absorption of nitrate by the roots. During seasons when minimum temperatures are not low, plants deficient in nitrate and high in carbohydrates may fruit months earlier than others that contain a more liberal nitrate reserve but a lower carbohydrate concentration. However, following a single night of relatively low temperature or several nights when it is not so low, plants comparatively high in nitrate—as well as others that are lower—may apparently differentially flower primordia simultaneously. There are 33 references.

Post-mortem darkening of plant tissues and its relation to respiration. E. A. H. ROBERTS (*Nature [London]*, 148 (1941), No. 3749, p. 285).—A preliminary note on the mechanism of the darkening of plant tissues and its relation to respiration, based largely on experiments with fermentation of tea leaves.

Quantitative study of ethylene production in relation to respiration of pears. E. HANSEN. (Oreg. Expt. Sta.). (*Bot. Gaz.*, 103 (1942), No. 3, pp. 543-558, figs. 7).—In fruit in air at 20° C., the rate of ethylene production increased during the climacteric rise in respiration, reached a peak at the respiratory climax, then declined during the postclimacteric period. During the climacteric

ethylene production increased from sevenfold to eightyfold, whereas respiratory rate approximately doubled. Each variety (Bartlett, Doyenne du Comice, and Anjou) tested had a characteristic maximum rate of production. That for Bartlett, which maintains its capacity to ripen for only a short period in storage at 0°, was 3.25–4.48 cc. per kilogram-day. That for Anjou, which maintains its capacity for ripening for a long time in cold storage, was 0.57–0.78 cc. per kilogram-day. The maximum rate of respiration for Bartlett is about double that for Anjou. Under anaerobic conditions ethylene production was either greatly retarded or stopped. In the fruits used for these experiments there was but little difference in CO₂ production under aerobic v. anaerobic conditions. The maximum rate of ethylene production occurred at 20°, at higher temperatures production decreasing and being stopped at 40°. Respiratory activity as measured by either CO₂ production or O₂ consumption was greatly accelerated at 20°–40°. There are 22 references.

Studies on iron in plants with special observations on the chlorophyll : iron ratio, R. HILL and H. LEHMANN (*Biochem. Jour.*, 35 (1941), No. 10–11, pp. 1190–1199).—From determinations of the Fe and chlorophyll contents of green leaves and leaflets throughout a season in *Sambucus nigra*, *Hippocastanum*, *Lamium album*, and *Claytonia perfoliata*, Fe always preceded chlorophyll in appearance and disappearance. Blooms and fruits contained an appreciable amount of Fe, but this fact was without any influence on the Fe content of elder and chestnut leaves. In the whole chestnut fruit two-fifths of the Fe was in the woody shells of the embryo. In *Claytonia* much of the Fe lost from the green leaves in the latter part of the season was found again in the seed, and the chloroplasts of its leaves contained four times as much Fe (said to be the first measurement for chloroplasts) as they would be expected to have were the Fe equally distributed throughout the leaves. During leaf development in evergreens Fe storage preceded that of chlorophyll. Green leaves of *Euonymus japonicus* from the preceding year had a chlorophyll : Fe ratio 10 times that of the current year, but the P : Fe ratio was the same in all leaves. It is suggested that the high P content of yellow leaves may be connected with carbohydrate metabolism in absence of chlorophyll. *Aucuba japonica* and *Buxus sempervirens* behaved similarly to *Euonymus*. The chlorophyll : Fe ratio was also determined in *Tulipa*, horseradish, spinach, *Tropaeolum*, *Alliaria officinalis*, and *Sambucus nigra* (Golden variety). The ratio was the same in the shade and sun leaves of the *Alliaria*, whereas the two forms of elder differed in pigment but not in Fe content. The Fe content of most plants studied was about one-fourth to one-tenth of the chlorophyll compared per mol. Some Fe in plants was soluble in acetone, some in water, and some insoluble in both, and three kinds of water-soluble Fe were observed.

Some observations on the daily march of photosynthesis in the leaves of sugar cane, E. G. B. GOODING (*Trop. Agr. [Trinidad]*, 19 (1942), No. 3, pp. 45–47, figs. 2).—From the preliminary work reported it is concluded that, like coconut, coffee, and cacao, sugarcane also shows a marked decrease in assimilatory rate during midday on bright days. The maximum rate of apparent assimilation is said to be 10–12 mg. CO₂/hr./sq. dm. leaf surface.

The length of the photoperiodically effective twilight period, V. A. GREULACH. (Ohio State Univ.). (*Ohio Jour. Sci.*, 42 (1942), No. 2, pp. 71–72).—To obtain information on this point the author conducted six series of light intensity measurements, beginning before sunset and continuing until a photronic footcandle meter graduated to 1 footcandle failed to deflect. Assuming 1 footcandle as the minimum light intensity which is photoperiodically effective, the lengths of the effective twilight periods measured varied from 11 to 28 min., the mean being 19 min. The data are tabulated and discussed briefly.

Влияние fotoperiodicheskoi induktsii postofannym i preryvistym svetom na rost i razvitiye rastenii (Influence of photoperiodical induction by means of constant and intermittent light on the growth and development of plants), E. R. GÜBENET (E. HUBBENET) (*Izv. Nauch. Inst. Lesgafta (Bul. Inst. Sci. Lesshaft)*, 23 (1940), pp. 127-135, figs. 3; *Eng. abs.*, p. 135).—Studying the influence of photoperiodic induction with constant, intermittent, and mixed light on the growth and development of long-day plants (flax and barley) and short-day plants (*Perilla* and soybean), the following conclusions are drawn: The formative action of intermittent light differs from that of the same amount of continuous light. Photoperiodic induction by intermittent as well as by mixed light accelerates the flowering in long-day plants and delays or entirely checks the reproductive phase as compared to continuous light in short-day plants. Intermittent light with periods consisting of 1 bright and 3 dark minutes (1 + 3 periods) proved to be more efficient for shortening the vegetative period of the long-day plants than intermittent light with 1 bright followed by 19 dark minutes (1 + 19 periods). The 1 + 3 periods depressed the development of the vegetative mass and the grain yield in barley. The vegetative development of flax showed no difference under intermittent light and under the same amount of continuous light, while the seed yield was even higher than that of controls. Short-day plants reached their most luxurious development under 6 hr. continuous plus 4 hr. intermittent light (1 + 3). Apparently, conditions favoring intensive leaf blade development are unfavorable for the processes leading to flowering. By using intermittent light in greenhouses it was possible to obtain an earlier flowering of long-day plants and a more luxurious growth in ornamental short-day plants.

Floral initiation in Biloxi soybean as influenced by grafting, P. H. HEINZE, M. W. PARKER, and H. A. BORTHWICK. (U. S. D. A.). (*Bot. Gaz.*, 103 (1942), No. 3, pp. 518-530, figs. 3).—Plants or parts of plants subjected continuously to daily photoperiods of 17 hr. or more were used as one component of all grafts. Since plants of the Biloxi variety do not develop sufficient flower-forming stimulus on long photoperiods to cause floral initiation, they served to determine whether or not a flower-forming stimulus was transmitted across graft unions. They are referred to as receptors and the plant or plant parts grafted to them as the donors. The donor components were from the Agate, Batorawka, or Biloxi varieties of soybean, or from Red Kidney, Plentiful, Black Valentine, or Dwarf Horticulture varieties of common bean. A total of 490 Agate-Biloxi approach grafts were made, all forming strong unions and about 50 percent of the Biloxi receptors forming flower primordia. Of 80 Biloxi-Biloxi approach grafts, flower primordia were formed on no receptors whose donors received long photoperiods continuously and on only one receptor whose donor received short photoperiods after it was grafted. Of 85 Agate or Batorawka leaves grafted to Biloxi receptors, flower primordia developed on all 83 receptors on which the grafted leaf survived. Formation of flower primordia on Biloxi receptor plants to which an Agate leaf was grafted occurred only when the grafted leaf remained on the receptor 4 days or more. Flower primordia developed on all the Biloxi receptors of the 48 Agate or Batorawka stem grafts made. The flower-inducing stimulus passed either up or down through the graft union, depending on whether the receptor was the scion or the stock. Of 30 grafts of Biloxi leaves on Biloxi receptors and 20 of Biloxi stems to Biloxi receptors, all lived but flower primordia were formed on no Biloxi receptors. In some of these grafts the Biloxi donors had received long photoperiods at all times, in others they had received various numbers of short photoperiods prior to grafting. Of 60 leaf grafts and 30 stem grafts of common bean to Biloxi

soybean receptors, 59 of the former and 27 of the latter survived, but flower primordia were formed on no Biloxi receptors. Water and probably mineral nutrients move across the common bean-Biloxi soybean graft unions readily, but elaborated foods apparently do not.

The relation between xylem thickenings in primary roots of *Vicia faba* seedlings and elongation, as shown by X-ray irradiation, G. F. SMITH and H. KERSTEN (*Bul. Torrey Bot. Club*, 69 (1942), No. 3, pp. 221-234, figs. 9).—*V. faba* seedling roots from unsoaked seeds irradiated with soft X-rays exhibited a decreasing total elongation with increasing dosages. Histological studies of irradiated and control roots gave experimental proof that the type of wall thickening in vessels is determined by the extent of elongation in surrounding tissues. After onset of "delayed killing" in seedlings grown from X-ray irradiated seeds, evidenced by a decline in growth as it involves elongation, only pitted vessels were formed. This result is apparently related to a markedly decreased extent of elongation of cells surrounding the vessels.

Maceration method to demonstrate the vascular system in *Zea mays*, B. C. SHARMAN (*Bot. Gaz.*, 103 (1942), No. 3, pp. 627-629, figs. 2).—The method described relies on the fact that it is possible to remove the parenchyma and ground tissues by rotting and still leave intact the vascular bundles and highly lignified parts.

Effect of heat-drying upon the periderm of washed potatoes, R. O. BELKENGREN and E. S. CIESLAK (*Bot. Gaz.*, 103 (1942), No. 3, pp. 622-624).—This is a preliminary report on experiments indicating an increase in periderm thickness, especially noted in about 72 hr., which appeared to be initiated by the drying treatment. The increase and suberization were marked in young tubers with relatively thin periderm at the start. Obviously the heat absorbed by the tuber in the drier after removal of its external moisture stimulated periderm formation.

A schedule for chromosome counts in some plants with small chromosomes, B. L. HANCOCK (*Stain Technol.*, 17 (1942), No. 2, pp. 79-83, figs. 2).—Special features of the schedule used for somatic counts of *Galium* spp. were fixation with the Belling Navashin type fixative, modification of the Randolph card mount method to overcome the difficulty of the small diameter of the root tips by mounting together a number from the same plant, staining with dilute crystal violet after mordanting with 1 percent aqueous chromic acid, and addition of an extra stage of differentiation in absolute alcohol diluted with xylol to remove the strands of stain. It is suggested that this procedure will be valuable in chromosome counts of other plants where similar difficulties arise.

On the structure and staining of starch grains of the potato tuber, J. C. BATES. (Kans. State Col.). (*Stain Technol.*, 17 (1942), No. 2, pp. 49-56, figs. 20).—Full detailed procedures are given for differential staining with hematoxylin and for double staining with safranin O and fast green FCF. The effects are obtained by the action of a swelling agent, hematoxylin staining being preceded by the swelling action of formaldehyde and in the other case the formaldehyde being added to the stain solution.

Two convenient washing devices for tissues and slides, G. H. MICKEY and H. TEAS. (La. State Univ.). (*Stain Technol.*, 17 (1942), No. 2, pp. 65-68, figs. 4).—"Two improved mechanisms are described: (1) For washing fixed tissues, a device which utilizes a downward movement of water with a consequent thorough washing is most convenient, because the washing tubes may be removed or replaced instantly. (2) A pan for washing microscope slides, fitted with a valve stem from an automobile inner tube, produces unusually effective washing and accommodates as many as 80 slides at once."

A simple method of transferring tissues, M. W. OLSEN. (Md. Expt. Sta.). (*Stain Technol.*, 17 (1942), No. 2, pp. 73-74, fig. 1).—A tissue carrier is described by which fragile material may be safely transferred from one reagent to another without damage.

An inexpensive apparatus for cutting tissue sections on the sliding microtome by the "dry ice" method, M. V. ANDERS (*Stain Technol.*, 17 (1942), No. 2, pp. 85-87, figs. 2).—The apparatus described is inexpensive and easily constructed from materials in the laboratory or purchasable for less than 25 ct.

GENETICS

Número de cromosomas en las especies del género *Hordeum* espontáneas en los alrededores de Buenos Aires [Number of chromosomes in species of the genus *Hordeum* spontaneous in the environs of Buenos Aires], J. M. ANDRÉS (*Buenos Aires Univ., Rev. Facult. Agron. y Vet.*, 9 (1941), No. 2, pp. 100-108, figs. 4; *Eng. abs.*, p. 107).—The chromosome numbers found were as follows: In *H. chilense*, *H. pusillum typicum*, and *H. pusillum euclaston* $n=7$, and in *H. murinum leporinum* $n=14$. The average diameter of the microsporo-cytes of the species studied is given, and relations of these diameters in the polyploids series are discussed.

A cytogenetic study of Zea and Euchlaena, J. G. O'MARA. (Coop. U. S. D. A.). (*Missouri Sta. Res. Bul.* 341 (1942), pp. 16, pl. 1).—The corn × Florida teosinte hybrid was analyzed indirectly by the substitution of Nojaya teosinte for corn in the cross. This substitution was made on the basis of a pachytene analysis of corn × Nojaya teosinte, which indicated that corn and Nojaya teosinte have no detectable cytological rearrangements, and that chromosome pairing apparently is as close as in a pure species. Pachytene analysis of Florida × Nojaya teosinte indicated that, with respect to corn, Florida teosinte had an undetermined rearrangement on the end of the long arm of chromosome 4, a rearrangement in the long arm of chromosome 8, and an inversion in the distal half of the short arm of chromosome 9. Existence of the inversion was confirmed genetically by the demonstration that corn × Nojaya teosinte, which showed no inversion at pachytene, had crossing-over in the *C-ax* interval, an interval which has practically no crossing-over in corn × Florida teosinte hybrid.

Hereditary susceptibility to X-ray injury in *Triticum monococcum*, L. SMITH. (U. S. D. A. and Mo. Expt. Sta.). (*Amer. Jour. Bot.* 29 (1942), No. 2, pp. 189-191, fig. 1).—A mendelian factor was found in einkorn wheat which distinctly increased the susceptibility of dormant seeds to X-ray injury. In preliminary tests the factor had no apparent effect on mutation rate or on susceptibility to heat injury.

Occurrence of the dwarf-red character in upland cotton, S. C. McMICAEL. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 8, pp. 477-481).—A new genetic character isolated in Acala upland cotton and designated as "dwarf-red" originated as a chimera on an otherwise normal green plant. Vegetative parts of dwarf-red Acala are dark red, whereas fruiting parts, as petals and bolls, are normal in appearance. Dwarfing is caused by decrease in both the number and length of internodes, and is completely associated with red-plant coloration. Inheritance studies indicated that dwarf-red is controlled by a single factor.

Two genetic characters of tomato fruits that might be mistaken for symptoms of disease, P. A. YOUNG. (Tex. Expt. Sta.). (*Phytopathology*, 32 (1942), No. 5, pp. 436-438, fig. 1).—Prominent stripes and deep pits in the peel of tomato fruits proved to be related characters that were inherited through three generations and that apparently had resulted from mutation. The symptoms are contrasted with tomato fruit pox and fruit stripe.

Somatic chromosomes of *Aconitum noveboracense* and *A. uncinatum*, D. J. LONGACRE (*Bul. Torrey Bot. Club*, 69 (1942), No. 3, pp. 235-239, figs. 7).—The somatic chromosome number of these two species indigenous to the Appalachian Mountains of the eastern United States was found to be 16 ($2n=16$). Further details are given.

Chromosome number of *Zanthoxylum americanum*, R. I. WALKER. (*Univ. Wis.*). (*Bot. Gaz.*, 103 (1942), No. 3, pp. 625-626, figs. 8).

[Animal breeding and physiology of reproduction investigations by the Tennessee Station] (*Tennessee Sta. Rpt. 1940*, pp. 23-25, 26-30, 48-49, figs. 7).—Brief results are presented by M. Jacob, J. E. Parker, and B. J. McSpadden of investigations of the influence of gonadotropic hormones on the lambing of ewes; comparison of native mountain and northwestern grade ewes and lambs; physiology of reproduction studies with jackstock; effect of adequacy of diet and vitamin A deficiency on sperm production and testes size in cockerels; and artificial insemination in poultry.

[Investigations with poultry and animal breeding and physiology by the New Jersey Stations] (*New Jersey Stas. Rpt. 1941*, pp. 11-14, 28-29, 30, 31, 32-34, 35, 71, 72).—Brief results are reported of advantages to dairymen from artificial breeding associations; variations in semen samples from dairy bulls, and relation of exercise to the amount and quality of semen produced; influence of feeding sprouted oats on breeding capacity of dairy bulls; semen yields of successive ejaculates of dairy bulls; relation of inbreeding to sire indexes for fat production in Holsteins; transmitting ability of dairy sires; herd improvement work in New Jersey; viability of pullets from old and young breeders; progress in selection for body size of White Leghorns; the sexing of day-old Barred Plymouth Rock chicks according to external characters; effectiveness of progeny testing for improving egg production and reducing adult mortality in individual cages; monthly yield standards for commercial egg farmers; calculation of egg yields by commercial farmers; length of time pigeons will continue to produce squabs at the normal rate; commercial significance of egg-laying ducks; reduction of mortality in pigs by posterior pituitary solutions injected into sows during parturition; and quality of semen produced by buck goats when does are not in heat.

Record of performance in Hereford cattle, B. KNAPP, JR., A. L. BAKER, J. R. QUESENBERRY, and R. T. CLARK. (*Coop. U. S. D. A.*). (*Montana Sta. Bul. 397* (1941), pp. 30).—From a study by variance and covariance of the progeny of 13 Hereford sires raised at the U. S. Range Livestock Experiment Station, Miles City, Mont., and at Bozeman, from 1935 to 1940, it was concluded that inherited differences between the progeny of various sires may be demonstrated by weaning weights, daily gain, efficiency of gain, dressing percentage, and weights of the heifers at 18 and 30 mo. of age. Rates of gain during the previous suckling period did not serve for an accurate indication of the efficiency of gain in the feed lot but should be included in the performance program because of its relation to conformation. In completing the analysis for the meat data significant differences were shown between years, but in general the results on the meats were negative as far as hereditary characters were concerned. A program for progeny testing beef cattle should be based on rate and efficiency of gains, dressing percentage, slaughter and carcass grades, and uniformity of the progeny, as well as heifers at breeding age.

Effect of the gonadotropic substance of pregnant mare's serum on the blood plasma-ascorbic acid of the bovine, R. E. ERB and F. N. ANDREWS. (*Purdue Univ.*). (*Endocrinology*, 30 (1942), No. 2, pp. 258-262, figs. 2).—Reductions of 20-67 percent in the venous blood plasma-ascorbic acid of four cows

and two bulls followed in 24-hr. subcutaneous injections with 1,000-2,250 rat units of the gonadotropic substance in pregnant-mare serum. Plasma-ascorbic acid returned to normal levels in 8-10 days, or more rapidly when ascorbic acid was injected.

Blood copper of ewes during pregnancy, A. EDEN (*Biochem. Jour.*, 35 (1941), No. 7, pp. 813-815).—Monthly variations in the blood copper of 21 ewes during pregnancy fell within the normal range of nonpregnant sheep (L. S. R., 85, p. 668) and bore no relation to the stage of pregnancy or the hemoglobin content of the blood.

The inheritance of a hemophilia-like condition in swine, R. BOGART and M. E. MUHRER. (Mo. Expt. Sta. and U. S. D. A.). (*Jour. Hered.*, 33 (1942), No. 2, pp. 59-64, figs. 4).—A condition in swine resembling hemophilia in man was observed to increase by inbreeding. In general the severity of the condition increased with age, the first expression being at about 2 mo. All of 19 pigs from bleeders \times bleeders were bleeders except 3 that died before weaning. Although bleeders were produced by normals, or normals mated with carriers, the bleeder condition was considered mainly due to a recessive gene. Mating a normal δ with a bleeder q showed that the condition was not sex-linked by the production of 7 normal pigs of both sexes. Some bleeders showed normal condition, but there was frequently internal as well as external hemorrhage.

The accessory reproductive tract in mammalian true hermaphrodites, an effect of position, S. A. ASDELL. (Cornell Univ.). (*Amer. Nat.*, 76 (1942), No. 762, pp. 75-84).—In connection with a survey of literature on hermaphroditism it is shown that the development of the accessory reproductive organs in different species from rodents to man is influenced by the nature of the gonadic tissue in the proximity and on the same side. Male accessories required testicular tissue even though ovarian tissue is present. On the other hand q accessories may develop in the absence of ovarian tissue.

The placentation of an antelope (*Rhynchotragus kirkii nyikae* Heller), G. B. WISLOCKI (*Anat. Rec.*, 81 (1941), No. 2, pp. 221-241, pls. 3, figs. 2).—The pregnant uterus, fetal membranes, and cotyledons of a small African antelope shot in midpregnancy are described.

Three generations of deaf white cats, D. WOLFF (*Jour. Hered.*, 33 (1942), No. 2, pp. 39-43, fig. 1).—Histological study is reported of the ear region of three generations of deaf white cats.

Heredity and accident as factors in the production of taillessness in the rat, L. C. DUNN, S. GLUECKSOHN-SCHOENHEIMER, M. R. CURTIS, and W. F. DUNNING (*Jour. Hered.*, 33 (1942), No. 2, pp. 65-67, fig. 1).—The tailless condition in rats seemed to be due to the failure of some normal process during ontogeny. Observations indicated both hereditary and nonhereditary taillessness to occur. It is suggested that the same type of explanation as given by Wright for otocephaly in the guinea pig (E. S. R., 73, p. 165) serves for the explanation of taillessness. A genetic constitution determines the threshold of a reaction subject to alteration by minor or random accidents. After crosses and inbreeding for 5-6 generations, tailless rats were shown to have the same genetic constitution as their normal sibs.

Effect of purified pituitary preparations on liver weights of hypophysectomized rats, H. L. FRAENKEL-CONRAT, M. E. SIMPSON, and H. M. EVANS. (Univ. Calif.). (*Amer. Jour. Physiol.*, 135 (1942), No. 2, pp. 398-403, fig. 1).—Studies of the actual changes in the liver weight and its relation to body weight of hypophysectomized rats injected with thyrotropic and growth hormones and globular fractions of the pituitaries showed that the thyrotropic hormone stimulated both liver and body growth similar to the effects of thyroxin.

Purified growth hormone induced body growth only, resulting in a decrease in the relative size of the liver. Both hormones caused similar increases in food intake. The experiments were conducted with groups of 8-10 hypophysectomized rats intraperitoneally injected for 10 days with 0.5 cc. of the pituitary solutions or thyroxin subcutaneously injected. The relative purity of six pituitary hormones is indicated (E. S. R., 86, p. 614).

Copper-induced pseudopregnancy in the adult estrous rat, A. DURY and J. T. BRADBURY. (U. S. D. A.). (*Amer. Jour. Physiol.*, 135 (1942), No. 3, pp. 587-590, figs. 3).—Intravenous injection of 0.1 or 0.15 cc. of a 1.0-percent copper acetate solution into normal regularly cycling rats induced a prolonged dioestrous or pseudopregnancy, as was observed by Emmens (E. S. R., 84, p. 174) in the rabbit.

Effect of purified pituitary preparations on the insulin content of the rat's pancreas, H. L. FRAENKEL-CONRAT, V. V. HERRING, M. E. SIMPSON, and H. M. EVANS. (Univ. Calif.). (*Amer. Jour. Physiol.*, 135 (1942), No. 2, pp. 404-410).—Intraperitoneal injections of anterior pituitary hormones for 10-42 days into rats showed that the lactogenic hormone increased the pancreatic activity in both normal and hypophysectomized animals. The opposite action was produced by the growth hormone in normal and adrenalectomized animals but not in those which were hypophysectomized. The insulin increasing action of crude adrenocorticotrophic preparations was attributed to contamination with the lactogenic hormone. The changes in the insulin production averaged up to 275 percent in the pancreatic insulin content in hypophysectomized ♂s treated with the adrenocorticotrophic hormone. Decreases in the pancreatic insulin content averaging 40 percent followed the treatment of normal ♂s with growth hormone. Five unfractionated alkaline extracts of beef anterior pituitary had slight pancreatic action unless administered in excessive doses. More than 75 groups of 5-10 experimental and control rats were included in the study.

Effect of crystalline estrin implants on the proximal tibia and costochondral junction of young female rats, M. E. SIMPSON, E. A. KIBRICK, H. BECKS, and H. M. EVANS. (Univ. Calif.). (*Endocrinology*, 30 (1942), No. 2, pp. 286-294, figs. 10).—The principal distinguishing characteristic in ossification in the tibia and rib of young rats as a result of oestrogen treatment was the difference in the amount and distribution of osseous tissue. Six rats from each of five groups were included in the study. A pellet of 10 mg. of alpha-oestradiol dipropionate was implanted under the skin at 71 days of age in one group. Another group received three weekly implants beginning at 54 days of age. A third group received six weekly implants. Control and experimental groups were autopsied at 76 and 96 days of age. Histological study of the right tibia and right ribs showed that oestrin pellets caused in 7 days a marked shrinkage of the epiphyseal cartilage, but with three weekly implants there was striking hyperossification without apparent differences in the food consumption. After 6 weeks there were signs of resorption and reorganization into thicker and more widely spread trabeculae. After oestrinization the growth disks of the costochondral junction displayed a series of regressive changes which increased in severity with the prolongation of treatment.

The influence of ascorbic acid on the activity of gonadotropic hormones, A. V. DI CIO and M. SCHTEINGART (*Endocrinology*, 30 (1942), No. 2, pp. 263-264, fig. 1).—The daily administration of 50 mg. of ascorbic acid and 25 rat units of gonadotropic hormone for 20-30 days to 2-4-month-old rats produced almost double the development of the testis and penis and of ♀ genitalia, as contrasted with the effects produced by the hormone alone. Ascorbic acid alone or simultaneous treatments in short periods produced no change in the gonad size. In the study 4 groups of 12 animals each were employed.

Chromosome breakage and recovery in the mouse, *Mus mus*

AUERBACH (*Nature [London]*, 148 (1941), No. 3756, pp. 501-502, fig. 1).—Decreased litter sizes were produced by ♂s from three semisterile strains induced by X-rays on crossing with semisterile ♀s. The segmental changes in the chromosome mutations first induced by X-rays were transmitted. Litter sizes reported averaged 2.6, 4.2, and 3.6 as contrasted with 7.7 in the control stock. Thus semisterility caused by the X-rays was transmitted to successive generations, but question still existed as to the role of position effect in chromosome interchanges.

The morphogenesis of pigment in the hair follicle of the house mouse, N. KATISS (*Jour. Morphol.*, 70 (1942), No. 2, pp. 209-219, pl. 1).—The physiology of pigment production was found to be fundamentally the same in yellow and brown-black color formation. The study was based on histological sections of skin from 3- to 6-day-old animals. The yellow and black pigments were organized in small discrete granules, the yellow being always spherical while the brown-black was oval. Color transition from yellow to brown-black is not a sharp one. The only pigment that can be called diffuse is the yellow tinting of the keratinized nuclei of cells containing granular yellow pigment.

A case of probable superfetation in a mouse, R. E. STOWELL (*Anat. Rec.*, 81 (1941), No. 2, pp. 215-220).—A case of probable superfetation in the mouse is described in which a ♀ was separated from the ♂ and a few days later had a litter of six normal young. A second litter of eight normal young was born 15 days later but they died in 24 hr.

Studies in the genetics of *Drosophila*, directed by J. T. PATTERSON (*Tex. Univ. Pub.* 4032 (1940), pp. 256, pls. 2, figs. 19).—Articles which emphasize the more recent advances in crossing over, disjunction, polyploidy, cytology, and mutation in *D. melanogaster* and *D. virilis* are presented on the relation between chiasma formation and disjunction (pp. 11-64), and chiasma formation in the hobbled region of the X chromosome (pp. 65-72), both by M. S. Brown; segregation and crossing over in a 2, 3 translocation (pp. 73-125), and multiple sex genes in the X chromosome (pp. 126-156), both by S. B. Pipkin; artificially produced tetraploid regions of the chromosomes, by W. J. Burdette (pp. 157-163); relation of temperature to fertility of hyperploid ♂s, by R. W. Cumley (pp. 164-166); aneuploidy involving the autosomes, by J. T. Patterson, Brown, and W. S. Stone (pp. 167-189); the w^{m+} and its derivatives (pp. 190-200), the second arm of chromosome 4 (pp. 201-207), and changing the structure of the genome (pp. 208-217), all by A. R. Griffen and Stone; evolution in the species, by Patterson, Stone, and Griffen (pp. 218-250); and hybridization in the *mulleri* group, by Patterson and J. F. Crow (pp. 251-256). Painter's chromosome map for *D. melanogaster* is included.

Nomenclature of fowl genetics, J. D. SMYTH (*Nature [London]*, 148 (1941), No. 3765, p. 781).—Some of the symbols which have been used in fowl genetics for referring to more than one characteristic by different authors are listed.

Sex-linked albinism in the turkey, *Meleagris gallopavo*, F. B. HUTT and C. D. MUELLER. (Cornell Univ.). (*Jour. Hered.*, 33 (1942), No. 2, pp. 69-77, figs. 4).—A recessive sex-linked gene was found responsible for albinism in turkeys. Thirty-one white turkeys were produced by 1 ♂ mated with 11 of 15 Bronze turkey ♀s in one pen. In further tests of eggs from ♂s and ♀s that had produced albinos, 3 ♂s sired 184 colored and 45 albino offspring older than 24 days incubation. At early ages the down of the albinos showed traces of pigment and in the eye some melanin was present. Of the albinotic poults 75 percent of the ♀s carrying it died. When hatched they were blind, and most of them died within 6 weeks as a result of failure to see, find, and eat their feed.

The physiology of egg size in the domestic fowl, H. M. SCOTT. (*Abstr. Thesis, Univ. Ill., Urbana, 1938, pp. 8*).—Changes in egg weight in fowls were due to the position of the egg in the clutch and the time that the egg spent in the oviduct, but yolk weight remained constant for the same bird although differences in the size of the yolk influenced the weight of the white. The secretion of egg white showed that it was proportional to the time spent in the magnum region of the oviduct. The amounts of white expected were reduced as much as 81 percent by substituting small for large yolks. The weight of the albumin in an egg was reduced by resection of the anterior, middle, and posterior regions of the magnum averages of 1.35 ± 0.54 , 5.76 ± 0.59 and 4.44 ± 0.46 gm., respectively. White weight and egg weight were more highly correlated with oviduct length than with body weight. The largest eggs were laid by Black Minorcas, which had the longest oviducts of any of six breeds of chickens. It was also noted that the yolk weight of this breed was smaller than that of the other breeds. For two flocks of White Leghorns of 60 and 70 Kansas and Illinois Leghorn hens each there were linear correlations of about 0.56 between the weight of the yolk and the body weight and the length of the magnum and the weight of the white. Yolk weight and magnum length, independent of each other or other variables studied, were highly correlated with the weight of the white. It was possible to account for 40 percent of the total variance in egg white weight by the yolk weight and the length of the magnum. Injections of 60–150 rat units of follicular hormone did not alter the amount of white secreted.

Semen production of White Leghorn males from strains selected for high and low fecundity, D. G. JONES and W. F. LAMOREUX. (*Cornell Univ.*). (*Poultry Sci.*, 21 (1942), No. 2, pp. 173–184, figs. 7).—A study of the body and testicle weights, semen production, and histological changes in the glandular tissues of the high- and low-producing strains of White Leghorn fowls of Hall (*E. S. R.*, 72, p. 171) showed that the effective genetic selection has been accompanied by high or low reproductive capacity of the ♂ as well as the ♀, although body weights and testicle weights were not significantly different. The ♂s of the high production strain attained sexual maturity at younger ages and produced considerably more semen at later ages, even when paired on a comparable body weight basis than ♂s selected from the low-producing line. These differences in the activity of testes from the two strains were observed histologically. Even after 20 weeks of age the larger proportion of the tubules in ♂s from the high-producing strain were active. Evidently semen production in ♂s and egg production in ♀s are expressions of comparable genotypes for high and low fecundity.

Comparative gonadotropic potency of unfractionated extracts of poultry pituitaries, R. E. PHILLIPS. (*Iowa Expt. Sta.*). (*Poultry Sci.*, 21 (1942), No. 2, pp. 161–172, figs. 7).—The average threshold amount of acetone-dried pituitary material required to produce standard histological response in the vaginal epithelium and ovaries of immature rats following two daily injections for 3 days with autopsy on the fourth day was ascertained for several types of poultry. Hypophysis material from capons, spring fryers, and roasters caused marked follicular development contrasted with the ovaries of animals injected with pituitary powder from fowl. Sex did not seem to exert any influence in turkeys 26–30 weeks of age, although age and state of reproductive activity had a pronounced effect on the gonadotropic potency of avian pituitaries. In general the glands of young birds and nonlaying ♀s were more potent than those of older birds and laying hens. No differences in the gonadotropic potency of pituitaries from the heavy breeds, crossbreeds, and Leghorns of the same age and stages of reproduction were noted. One positive response was obtained from duck hypophysis. Although the amounts of glandular materials obtained were insuffi-

cient, indications were that the hypophysis of old cocks, geese, guineas, and pheasants did not contain appreciable gonad-stimulating properties. Pituitaries from ♂ birds were more potent than pituitaries from ♀s. Because of size it seems doubtful if removal of the pituitaries from fowls may develop into a commercial practice.

Diurnal rhythm of mitotic activity in the seminiferous tubules of the domestic fowl, E. L. MACARTNEY (*Poultry Sci.*, 21 (1942), No. 2, pp. 130-135, figs. 2).—The number of mitotic figures in the testes of the domestic fowl was shown to reach a maximum at 12 o'clock midnight with a minimum at 6 a. m. The number of dividing cells was significantly higher in the afternoon and at night than in the morning and did not seem to be controlled by light. Time of feeding is suggested as one of the controlling factors in mitotic activity. The trend in metaphase counts was similar to the trends in total dividing spermatocytes. The total number of dividing figures in the right testis was significantly greater than in the left testis, but the number of divisions in the two sides were correlated. The study was conducted by making three cross sections through each testis removed from four birds at 2-hr. intervals. Four hr. before killing the birds were injected with 1 mg. of an aqueous solution of colchicine per 100 gm. body weight.

Induction of mating behavior in male and female chicks following injection of sex hormones, including notations on body weight and comb growth, G. K. NOBLE and A. ZITRIN (*Endocrinology*, 30 (1942), No. 2, pp. 327-334, figs. 2).—All stages of sexual behavior and mating response were exhibited by chicks injected with gonadotropic hormones. Crowing of ♂s was induced as early as the fourth day of age and treading by 13 days following daily injections of 0.5 mg. of testosterone propionate. The squatting behavior of ♀s was observed after the fifteenth to eighteenth daily injection of 0.17 mg. of oestradiol benzoate beginning at 17 days of age. The control ♂s grew more rapidly than injected birds but the opposite occurred in ♀s. In a second experiment the behavior of ♂s was similar to results in the first experiment but ♀s showed no mating tendency. Comb growth was stimulated by treatment of ♂s but after treatment ceased combs retrogressed more than in control ♂s.

The chick comb for androgen assay, W. R. BRENNEMAN (*Endocrinology* 30 (1942), No. 2, pp. 277-285, figs. 8).—The results of several experiments showed that the chick can be used for the determination of small amounts of androgens. Testosterone propionate and testosterone in doses ranging from 1 to 1,000 μ g. were administered to 1,318 White Leghorn chicks as in previous investigations.¹ It was shown that chicks on limited diets give better responses than chicks on normal diets. On normal diets for 15 days injections of 25-50 μ g. caused some suppression in comb growth, but with 75-100 μ g. significant growth was produced. With the diets limited by feeding only on alternate days, responses in both sexes were relatively much greater up to 500 μ g. It is considered that limitation of the diet caused decreased pituitary and gonadic secretions, thus making the chicks low in gonad secretions. Chicks caponized at 5 days and given comb injections of 1 μ g. of hormone on alternate days had comb increments of more than 31 percent at 20 days of age. Normal diet pullets similarly treated gave significant but somewhat smaller responses. An 80-hr. assay method showed relatively small variation. This was based on simultaneous injection of chicks 12 hr. after hatching and with four additional injections at 12-hr. intervals but without food or water. Positive responses were obtained to 200 μ g. injections 20 hr. after the last injection. Because of the low standard errors the 80-hr. test seems worthy of further study.

¹ *Endocrinology*, 26 (1940), p. 1091.

FIELD CROPS

[Farm crops research in Mississippi] (*Miss. Farm Rec. [Mississippi Sta.]*, 5 (1942), No. 4, pp. 1, 3-6, 7, 8, figs. 10).—In addition to Fertilizers for Starch Sweetpotatoes (see p. 370), experiments with field crops are reported on in articles entitled Lespedezas Lead Annual Hay Plants, by H. W. Bennett (pp. 1, 7); Planting Rate an Important Factor in Soybean Hay Yield (p. 7), and Soybeans for Grain (p. 8), both by H. A. York; and Hay Crop Removal Exerts Heavy Drain on Soil Fertility, by C. D. Hoover (p. 8).

[Research with farm crops in New Jersey] (*New Jersey Stat. Rpt. 1941*, pp. 19-20, 56-57, 58, 62-64, 65-67, 68-69, 94-98, pls. 3).—Field crop experiments (E. S. R., 84, p. 751) reported on included breeding investigations with corn, barley, and lawnglass; variety trials with corn (and hybrids), barley, potatoes, soybeans, and red clover strains; comparative resistance or tolerance of New Jersey corn hybrids and open-pollinated varieties to European corn borer; relation of the amount of green coloring matter in corn leaves to plant growth; establishment of grasses and legumes in permanent pasture without plowing; recommended fertilizer, seeding rates, and time of harvest for soybeans, Sudan grass, millet, sorghums, and their combinations as emergency hay crops in dry years; fertilizer tests with potatoes, sweetpotatoes (including starter solutions), and alfalfa (with K); relation of times of planting and digging sweetpotatoes to yields and of time of digging to keeping quality; seed value of potato tubers showing net necrosis; place of Ladino clover, Cumberland and Kentucky 101 strains of red clover, soybeans, and spring barley in New Jersey farming; soil treatment to increase the depth and spread of red clover roots; possibility of ryegrass as a weed and its control; and experiments with fine turf, including time for making new grass seedings, choice of grasses for durable sod in the shortest time, fertilizers for vigorous growth of sod-forming grasses, kinds of grasses best suited to aviation landing fields, merits of hay grasses for landing fields, parks, and recreation fields, establishment of sod on subsoil, best grasses in partially shaded areas, plowing, mowing, and cutting turf grasses, and introduction of improved grasses into established sod.

[Field crops investigations in New Mexico]. (Partly coop. U. S. D. A. et al.). (*New Mexico Sta. Rpt. 1941*, pp. 15-31, 33-38, 39-42, 76-77, 82-85, figs. 5).—Research with field crops (E. S. R., 85, p. 182) reported on again from the station and outlying fields comprised variety tests with winter- and spring-sown wheat and barley, oats, corn for grain and silage, grain sorghum, sorgo, millet, cotton, potatoes, sugar beets for yield and curly top resistance, alfalfa, soybeans, cowpeas, beans, annual hay crops, and miscellaneous forage crops; breeding work with sugar beets, cotton, wheat, barley, sorghum, soybeans, and pinto beans; seed treatment and irrigation tests with cotton and potatoes; seedbed and irrigation studies with corn; seed sources and planting distances with potatoes; fertilizer experiments with sugar beets, cotton, and alfalfa; cutting experiments with alfalfa; a date of seeding test with wheat; tests of safflower; tests of different forms of sulfur and crop sequences with cotton; effects of different irrigation treatments on maturity, lint, and yield factors of Acala cotton; studies of the annual production of sugar beet seed concerned with effects of preceding crops, manure, and fallow; studies of restoration of ranges by natural and artificial revegetation; and control of Johnson grass by burning and sodium chlorate.

[Field crops research in South Carolina]. (Partly coop. U. S. D. A.). (*South Carolina Sta. Rpt. 1941*, pp. 32-40, 53-56, 98-115, 121-123, 132-138, 139, 140-147, 149-151, 167, 168-173, figs. 14).—Reports of progress (E. S. R., 85, p. 42) are made by G. B. Killinger, W. R. Paden, F. Moser, J. B. Edmond, G. H. Dunkelberg, E. D. Kyzer, J. E. Love, H. P. Cooper, E. E. Hall, F. M. Harrell, W. H.

Jenkins, D. C. Harrell, J. F. Bullock, J. A. Riley, R. W. Wallace, W. A. Carns, N. McKaig, Jr., A. B. Bowen, E. M. Roller, R. L. Smith, and O. B. Garrison from agronomic experiments at the station and substations, including variety tests with cotton, corn (and hybrids), oats, wheat, barley, rye, grain sorghum, sorgo, and soybeans; breeding work with upland and sea-island cotton; genetic studies with cotton also concerned with inheritance of lint length and percentage, seed weight, plant yield, size of bolls, and color of seed fuzz, and behavior of characters in crosses with upland and sea-island cotton; fertility and pH levels for crimson clover; a comparison of oats-vetch mixtures and crimson clover for hay; an adaptation trial of Alyceclover as a hay crop; establishing and maintaining annual clovers in carpet grass pastures; improvement of Porto Rico sweetpotatoes and studies of flue-heated sweetpotato hotbeds; studies of electricity in sweetpotato plant production, including influence of type of hotbed cover, "crowded" and regular bedding of roots, and influence of fertilizers and of soil temperature; planting rates for oats; fertilizer and nutrition studies with cotton dealing with placement, time and rate of applying K and N, N carriers in varying percentages and as side dressings, and yields after rye and winter legume covers; tobacco experiments, including tests of K carriers and rates and improvement of the curing process, both with flue-cured tobacco; green manure-fertilizer experiments; fertilizer experiments with oats and soybeans; and tests of rates of N carriers and K as side dressing for oats.

[Field crops experiments in Tennessee]. (Partly coop. U. S. D. A.). (*Tennessee Sta. Rpt. 1940*, pp. 4-9, 15-17, 85, 88, 90-91, 92-94, 97-98, 99-101, 101-104, 104-107, figs. 2).—Progress results are reported (E. S. R., 85, p. 470) by N. I. Hancock, J. K. Underwood, L. S. Mayer, J. J. Bird, B. D. Drain, A. B. Strand, D. M. Bailey, L. A. Fister, K. L. Hertel, C. D. Sherbakoff, L. R. Neel, B. P. Hazlewood, and F. S. Chance from agronomic studies at the station and substations, including breeding work with cotton, corn, oats, barley, sweetpotatoes, tobacco, red clover, and pasture grasses; variety trials with cotton, corn and corn hybrids, oats, barley, tobacco, potatoes, sweetpotatoes, soybeans, lespedeza, and grasses; production tests with Alyceclover and Lappacea clover; cultural, including planting, experiments with corn, cotton, soybeans, barley, tobacco, and potatoes; lespedeza v. soybeans sown in barley; fertilizer experiments with potatoes and tobacco; research on technic and devices for measuring length and fineness of cotton fiber and on the relation of yarn structure to yarn strength; comparison of winter cover crops; tests of grazing value of browntopmillet and Sudan grass; and rotations and air-curing tests for burley tobacco.

[Field crops experiments in Washington]. (Partly coop. U. S. D. A. and Idaho Expt. Sta.). (*Washington Sta. Bul. 410* (1941), pp. 12-20, 56-57, 59-60, 100-103, 104-107, 108, 110-111, 112, 121, 124-125, 126-127, 128, 129-130).—Field crops work (E. S. R., 85, p. 471), reported on from the station and substations by O. E. Burbee, O. A. Vogel, E. G. Schafer, S. P. Swenson, E. F. Gaines, D. G. Wells, S. C. Vandecaveye, W. A. Harvey, C. Seely, A. G. Law, E. J. Kreizinger, C. L. Vincent, W. J. Clore, H. D. Jacquot, V. Smith, H. P. Singleton, C. E. Nelson, C. A. Larson, H. G. Nickle, D. J. Crowley, J. L. Schwendiman, P. E. Lemmon, R. F. Sackman, V. B. Hawk, L. A. Mullen, and D. D. Forsyth, included variety tests with spring and winter wheat and barley, oats, rye, corn (and hybrids), potatoes, seed flax, mustard, alfalfa, sweetclover, soybeans and edible soybeans, peas, grasses, and mixtures of forage crops; breeding work with barley, rye, wheat, oats, alfalfa, sweetclover, potatoes, and forage grasses; studies of inheritance of resistance to disease and other characters in wheat and rye hybrids and grass hybrids; cultural (including planting) studies with wheat, mustard, soybeans, and alfalfa; tests of time and amount of irrigation for sugar beets

and potatoes; factors affecting seed set in alfalfa; tillage and soil moisture studies; fertilizer trials with wheat, alfalfa, and sugar beets; crop rotations, including permanent fertility and organic matter maintenance studies; and control experiments with whitetop, bindweed, Russian knapweed, Canada thistle, and other perennials and the weeds of cranberry bogs.

Influence of thiamin additions on germination and growth of certain grasses and of white clover, G. H. AHLGREN (*New Jersey Stas. Bul.* 692 (1942), pp. 19).—Concentrations of thiamin of 0.01, 0.1, 0.4, 0.8, and 1.6 mg. per liter of solution were added to seeds of Kentucky bluegrass, timothy, perennial ryegrass, and white clover contained in sterilized petri dishes. Germination percentages and root and top weights of seedlings failed to show any response to added thiamin. A pot test with soil amendments consisting of peat, manure, ground limestone, and a 5-10-5 fertilizer mixture with and without added thiamin at concentrations of 0.1 p. p. m. was made with five grass species and with white clover. These additions of thiamin, although absorbed, did not stimulate growth, and fertility amendments had little effect on the concentration of thiamin in the tops of these species. When tap water and 0.01 and 0.001 p. p. m. of thiamin were applied to field plats of six established bentgrass strains on fertile soil, root studies and top clippings did not show significant differences between the treatments.

The *Phycomyces* assay showed that thiamin added in nutrient cultures to plants growing in sand will, at least temporarily, increase the concentration of this vitamin in the top growth. Low concentration of nitrate nitrogen did not affect the amount of thiamin in leaves of Kentucky bluegrass as compared to a medium concentration of nitrate nitrogen. Thiamin added to plants growing in soil was detectable in the top growth.

Use of phosphatic fertilizers on alfalfa, D. A. HINKLE (*New Mexico Sta. Bul.* 289 (1942), pp. 19, figs. 6).—In further phosphate fertilizer experiments (E. S. R., 75, p. 619) on alfalfa, 1938-40, applications of 44-percent superphosphate ranging from 180 to 450 lb. per acre, applied in spring when growth began and, at intervals during the growing season, did not increase the yield of hay more than 135 lb. applied at the beginning of growth. Sixteen- and 20-percent grades of superphosphate had no advantage over the more concentrated grades on a phosphorus-equivalent basis. Average hay yields from Ammo-Phos 11-48 and superphosphate did not differ significantly. Fertilization with phosphates could increase the P content of alfalfa hay as much as 30 percent if the soil lacks available P. Manure if available could be used to better advantage on row crops, on which greater increases in yields can be obtained than with superphosphate. Superphosphate to be used on alfalfa should be applied at the rate of 135 lb. per acre each year in the spring before active growth starts, in most areas before the first irrigation.

Spring barley in Illinois, G. H. DUNGAN and W. L. BURLISON (*Illinois Sta. Bul.* 485 (1942), pp. 585-596, figs. 5).—Spring barley is adapted to the northern half of Illinois, which lies within the spring-barley area of the United States. Variety trials, 1927-41, in northern and central Illinois showed that Wisconsin Barbless (Wisconsin Pedigree 38), smooth-awned, high-yielding, and suitable for malting, and also possessing resistance to stripe disease, is the best all-round barley for the State. In southern Illinois, where spring barley is not well suited, Spartan is the best variety. It is a smooth-awned, two-rowed barley suitable for pearling and feeding, matures early, and tillers abundantly. Information is also given on comparative yields of barley and other small grains, sowing and harvesting spring barley and its hazards, and quality requirements for malting.

Bur-clover cultivation and utilization, R. MCKEE (*U. S. Dept. Agr., Farmers' Bul. 1741, rev. (1942), pp. 11+12, figs. 7*).—A further revision (*E. S. R., 72, p. 762*).

Better strains of red clover, C. S. GARRISON (*New Jersey Stat. Cir. 419 (1942), [pp. 41]*).—Two superior strains of red clover, Kentucky 101 and Cumberland, now available for use in New Jersey, were shown to be disease-resistant and to yield well the first year of cutting, and, unlike ordinary red clover, to persist for a second year. Planting and fertilizer practices and seed production methods are outlined.

Vernalization and photo-periodic induction, II, III, D. CAIRNS (*New Zeal. Jour. Sci. and Technol., 22 (1941), Nos. 5A, pp. 279A-289A, figs. 3; 6A, pp. 359A-368A, figs. 3*).—In continuation (*E. S. R., 86, p. 22*), two papers are presented:

II. *White clover (Trifolium repens)*.—One vernalization treatment gave increased forage yield of 64.3 percent over the control group; seed production was only slightly affected; and prolonged treatment gave an earlier maturing plant and a higher percentage reaching maturity. Prolonged photoperiodic induction depressed the forage yield; seed production was reduced by all treatments; and fewer plants matured as the treatment was prolonged. The vegetative period of treated plants showed only slight variations from the controls.

III. *Red clover (Trifolium pratense)*.—All vernalization treatments given caused yield increases, in one group reaching 111 percent. The treatments had but little effect on the maturity of the plants, but the vegetative period was increased in all groups. All photoperiodic induction treatments increased the green-material yields, the maximum being 53 percent increase, but the seed yield was depressed in all groups and the vegetative period was longer in the treated plants than in the controls.

Corn growing for high yields and low costs per bushel, H. B. SPRAGUE (*New Jersey Stat. Cir. 427 (1942), pp. 4, fig. 1*).—Effective farm operations outlined include rotations, seedbed preparations, seed (New Jersey hybrids Nos. 2 and 4), planting, cultivation, cover cropping, harvest, and husking.

The Ohio cooperative corn performance tests, G. H. STRINGFIELD, R. D. LEWIS, and H. L. PFAFF. (Coop. U. S. D. A., Ohio State Univ., et al.). (*Ohio Sta. Spec. Cir. 64 (1942), pp. 26, fig. 1*).—Acre yields, dry matter in ears at harvest, days from planting to silking, and lodged and broken plants are reported for hybrids and open-pollinated corn varieties harvested from 55 tests grown in 1941 in 7 adaptation areas in Ohio, as in similar earlier tests (*E. S. R., 85, p. 186*).

1941 report, cotton variety tests in Oklahoma, H. E. DUNLAVY, I. M. PARROTT, F. W. SELF, and E. HIXSON. (Coop. U. S. D. A.). (*Oklahoma Sta. Misc. Pub. 4 (1942), pp. [2]+28, fig. 1*).—Continued cooperative varietal studies with cotton (*E. S. R., 83, p. 188; 85, p. 474*) have indicated that the several strains of Nucala (Acala 5) are most promising for profitable production in most sections of southwestern Oklahoma, and that Deltapine, Oklahoma Triumph, Stoneville, and Rowden variety groups are well adapted to central and eastern Oklahoma. In all three sections Hi-Bred has been a high-yielding cotton with a very short staple. The results of six variety and strain tests conducted in 1941 are tabulated, and an article, *Some Effects of Fleahoppers on Cotton Varieties* (pp. 22-26), reports on an investigation in Tillman County under the direction of Hixson.

Flaxseed production in the North Central States, A. C. DILLMAN and T. E. STOA. (Coop. N. Dak. Expt. Sta.). (*U. S. Dept. Agr., Farmers' Bul. 1747, rev. (1942), pp. 11+19, figs. 11*).—A revised edition (*E. S. R., 74, p. 333*).

Fiber flax in western Washington, E. G. SCHAFER (*Washington Sta. Pop. Bul. 166 (1942), pp. 11, figs. 2*).—The soil, fertility, and climatic needs of fiber flax, varieties, cultural and field methods, harvesting and storage practices, and ways to dispose of the crop described are based extensively on station experiments

and experience of growers. The status and history of fiber flax in Washington are discussed briefly.

Peanut production, H. O. WEST (*Mississippi Sta. Bul.* 366 (1942), pp. 67, figs. 17).—A revision of the publication noted earlier (E. S. R., 84, p. 39).

Soybean production in Nebraska, T. A. KIESSELBACH and W. E. LYNES (*Nebraska Sta. Bul.* 339 (1942), pp. 18, figs. 4).—A revision of Bulletin 322 (E. S. R., 82, p. 479).

Fertilizers for starch sweetpotatoes, W. S. ANDERSON (*Mississippi Sta. Bul.* 367 (1942), pp. 22, figs. 4; *abr. in Miss. Farm Res.* [*Mississippi Sta.*], 5 (1942), No. 4, pp. 1, 3-6, figs. 4).—Fertilizer experiments, 1935-38, with the Triumph variety of sweetpotatoes, largely noted earlier (E. S. R., 81, p. 509), demonstrated that Mississippi soils used largely for sweetpotato production respond favorably to fertilizer applications of about 600 lb. of 8-8-8 or 800 lb. of 6-6-6, or a home mixture of 300 lb. of sodium nitrate, 250 of 20-percent superphosphate, and 100 lb. of potassium chloride. Approximately half the N might be supplied with a winter legume crop turned under. N appeared to be the most important fertilizer element for sweetpotatoes. The data gave no conclusive evidence that fertilization affects materially either the starch content or shape of Triumph sweetpotatoes. Indications from parallel research were that, in general, results obtained in these experiments would probably apply to other varieties, as Porto Rico and Nancy Hall, grown in the hill sections of Mississippi. See also reports on sweetpotato plant production (E. S. R., 84, p. 756) and plant spacing (E. S. R., 85, p. 342).

Location of county wheat testing plots, 1940-1941, H. S. SMITH (*Oklahoma Sta. Misc. Pub.* 3 (1940), pp. [4], fig. 1).—The 33 testing plots in the 1940-41 Oklahoma farm wheat improvement program (E. S. R., 87, p. 219) are listed and located on an outline map.

Inspection of agricultural seeds, H. R. KRAYBILL ET AL. (Coop. U. S. D. A.). (*Indiana Sta. Cir.* 267 (1941), pp. 168, fig. 1).—The purity, germination, and weed seed contents, and for legumes the hard seed contents are tabulated from tests of 1,554 of the 1,923 official samples of seed collected from dealers in Indiana during the year ended June 30, 1941.

Seed inspection in Kentucky, 1940-41, W. A. PRICE, M. DIDLAKE, E. C. VAUGHN, E. DEEN, H. TILSON, A. McDANIEL, K. FRIED, M. MORTON, M. L. LITTELL, and L. BAUGH (*Kentucky Sta. Regulat. Ser. Bul.* 28 (1941), pp. 23).—Purity and germination percentages and, when present, excessive quantities of noxious weed seed are reported for 311 official samples of agricultural seed obtained from dealers during the year ended June 30, 1941.

Seed inspection, F. A. McLAUGHLIN (*Massachusetts Sta. Control Ser. Bul.* 111 (1941), pp. 93).—The germination, purity, and weed seed contents are tabulated for 2,941 official samples of field crops seed and mixtures and germination for samples of vegetable seed collected in Massachusetts during the period November 1, 1940, to November 1, 1941. The report also gives results of field tests for trueness to type and variety on lots of beans, beets, carrots, lettuce, radish, and turnip, in cooperation with G. B. Snyder; studies of flower seeds, in cooperation with C. L. Thayer, including tests for germination and performance; and type and performance studies with samples of commercial seed oats and 11 superior oats varieties, in cooperation with W. G. Colby.

Testing farm seeds in home and school, A. F. MUSIL (*U. S. Dept. Agr., Misc. Pub.* 437 (1942), pp. 88, figs. 38).—Apparatus and technic employed in making purity and germination tests on farm seeds and determining weed seed contents are described, with special considerations for testing different kinds of seeds, as of the ¹⁹⁴¹legumes, mustards, and grasses. Particular attention is given to the

identification of weed seeds. Appended lists indicate weed seeds illustrated and described and crop seeds in which they are commonly found and their scientific names. This publication supersedes Farmers' Bulletin 428 (U. S. R., 24, p. 640).

HORTICULTURE

[**Horticultural studies by the New Jersey Stations**] (*New Jersey Sta. Rpt. 1941*, pp. 36-38, 40-42, 43-45, 46, 47-48, 51-53, 55, 59-60, 75-76, 99-102, 102-105, 105-106, pls. 3).—In this progress report information is presented on studies relating to the improvement of varieties of apples by breeding, better cultural practices in apple culture, varieties of peaches developed by the station, the testing of peach varieties, nematode resistance in peach stocks, acidity and tannin content of peach fruits as related to dietary value, comparative hardiness of different peach varieties, identification of blueberry varieties by leaf characters, soil and water requirements of blueberries, the pruning of blueberries, the fertilization of cranberries and strawberries, organic matter for raspberry plantations, the value of deep tillage and lime in vegetable production, fertilizer studies with vegetables, vegetable seed conservation, the culture of the tomato and sweet corn, sweet corn hybrids for New Jersey, the value of the Rutgers World Beater No. 13 pepper, asparagus breeding, boron deficiency in the radish, the relation between iron and manganese in plant nutrition, the relation between boron and calcium in plant metabolism, the importance of an adequate oxygen supply for plants, the soilless culture of greenhouse plants, the use of root-promoting substances with cuttings, desirable varieties of ornamental shrubs, the growing of rhododendrons and azaleas, the causes of failure of narcissus bulbs to bloom, and general cultural requirements of ornamental plants.

[**Horticultural studies by the New Mexico Station**] (*New Mexico Sta. Rpt. 1941*, pp. 38, 39, 62-76, 77-79, figs. 4).—Information is presented on the progress of the following studies: Onion culture: phenology of fruits; varieties of tree fruits, cucumbers, tomatoes, safflower, paprika, pecans, walnuts, grapes, raspberries, currants, and gooseberries; lettuce culture with a view to determining the best strains and best time for planting to obtain satisfactory heading; flower growing; improvement of the White Grano onion; onion seed production; and the effect of growth-promoting substances in reducing the preharvest drop of apples.

[**Horticultural studies by the South Carolina Station**] (*South Carolina Sta. Rpt. 1941*, pp. 49-52, 74, 75, 151-163, 173, 175-177, figs. 4).—Among studies, the progress of which is discussed by W. T. Brightwell, J. H. Mitchell, E. J. Lease, D. B. Roderick, J. B. Edmond, L. E. Scott, W. C. Barnes, J. M. Jenkins, Jr., O. B. Garrison, and C. J. Nusbaum, are germination of muscadine grape seeds and growth of seedlings, the comparative mineral composition of cowpeas grown under various environmental conditions, the effect of boron on fruit production of grapes, fertilizers for cucumbers, determinations of quality in muskmelon varieties, effect of fertilizer placement on yield of beans and peas, the breeding of cucumbers for downy mildew resistance, the testing of edible soybean and lima bean varieties, and the breeding of improved varieties of muskmelons.

[**Horticultural studies by the Tennessee Station**] (*Tennessee Sta. Rpt. 1940*, pp. 81-85, 85-88, 88-90, 91, figs. 6).—Among studies discussed by B. D. Drain, A. B. Strand, D. M. Bailey, and L. A. Fister are the breeding of leaf spot-resistant tomatoes, the breeding of improved varieties of red raspberries, development of fire blight-resistant pears, inheritance in garden beans, the breeding of chrysanthemums, the culture of tomatoes, strawberry breeding, improve-

ment of sweet corn, and the adaptability of various fruits and vegetables for freezing preservation.

[**Horticultural studies by the Washington Station**]. (Partly coop. U. S. D. A., West. Wash. Expt. Sta., et al.). (*Washington Sta. Bul.* 410 (1941), pp. 33-34, 35, 55-56, 57-59, 60-66, 67-80, 107-110, 117-118, 121, 125-126, 127-128, 128-129).—Among studies, the progress of which is noted by D. F. Allmendinger, C. L. Bedford, R. L. Brown, R. M. Bullock, L. Campbell, W. E. Chapin, W. J. Clore, D. J. Crowley, H. Fallscheer, K. Groves, C. P. Harley, G. A. Huber, L. T. Kardos, A. L. Kenworthy, P. E. Lemmon, H. W. Miller, O. M. Morris, W. J. O'Neill, E. L. Overholser, F. L. Overley, J. L. St. John, C. D. Schwartz, J. H. Schultz, G. Sisler, C. L. Vincent, S. E. Wadsworth, and L. C. Wheeting, are the factors involved in the maturity of fruit, removal of spray residues, orchard cover crops, the relation of leaf area to fruit production and composition, methods of propagating hardy apple stocks, factors involved in winter injury to fruit trees, factors affecting set of fruit in Washington orchards, factors involved in spray injury, the use of growth-promoting sprays for preventing pre-harvest drop and for coloring apples, strawberry breeding, orchard fertilization, breeding raspberries for hardiness and disease resistance, orchard irrigation, fertilizer requirements of truck crops, the selection and breeding of truck crops, varietal tests of fruits, fruit storage responses, bud abscission in the gardenia, ornamental perennials for eastern Washington, orchard soil toxicity, the breeding of blueberries and cranberries, varietal studies of truck crops and tree fruits, resistance of small fruits to diseases, irrigation requirements of cranberries, the testing of ornamental shrubs and trees, and the production of nursery stock.

Ground covers for Florida gardens, J. M. CREVASSE, JR. (*Florida Sta. Bul.* 364 (1941), pp. 60, figs. 37).—General information is presented on the climatic adaptation, propagation, cultural methods, soil adaptation, light requirements, and desirable characteristics of a large number of species and varieties of plants useful as ground covers. In addition, tabulated lists are presented of ground cover plants for special purposes and of materials that might possibly be used as ground covers.

Plioilm in the preservation of Florida fruits and vegetables, A. L. STAHL and P. J. VAUGHAN (*Florida Sta. Bul.* 369 (1942), pp. 92, figs. 25).—Very good results were attained with several types of plioilm wrappers used in covering various important Florida fruits and vegetables. The plioilm wrappers were effective in reducing weight losses without limiting the escape of respiratory gases. In the case of citrus fruits, the original color of both the rind and the stem button was maintained in proportion to the preservation of other quality factors. Pitting of the rind was almost prevented in refrigeration of plioilm-wrapped fruits. The optimum storage temperatures varied somewhat with the different species. Studies with persimmons, mangoes, peaches, and avocados also gave favorable results, both in delaying the onset of softening and increasing the length of the period that fruits remained in marketable condition. With vegetables the percentage weight loss of unwrapped products was much greater than that of the wrapped material. There was markedly less shrivelling, less change in color, and less loss of flavor in the plioilm-covered vegetables. Appearance and tensile strength of the plioilm wrappers were unaffected by temperature, relative humidity, and other conditions of the experiment. In certain cases in which vitamin C was determined, there was a greater retention in the plioilm-protected than in the unprotected products.

Vegetable adaptability in the Wichita Valley, B. S. PICKETT and L. E. BROOKS (*Texas Sta. Bul.* 610 (1942), pp. 36, figs. 7).—Based on 13 years' observations on the adaptability of various vegetable species to the irrigated conditions of

the Wichita Valley, information is presented on the most desirable and productive species and their yields and characteristics. The relationship of temperature to vegetable production is discussed, with data on the available growing periods for various vegetable crops. The soil requirements of vegetables are outlined, with comments as to favorable soil reaction, etc.

Vegetable culture and varieties for Wyoming, M. F. BABB and W. L. QUAYLE. (Coop. U. S. D. A.). (*Wyoming Sta. Bul.* 250 (1942), pp. 40, figs. 3).—Presented in a popular manner, information is given on varieties of vegetables suitable for growing in Wyoming, together with general instructions with regard to culture and fertilization and comments as to food value, etc.

Hardiness and productiveness of U. S. No. 5 Refugee snap bean in the southern United States, B. L. WADE (*U. S. Dept. Agr. Cir.* 648 (1942), pp. 12, figs. 2).—The U. S. No. 5 Refugee, a mosaic-resistant bean of the Stringless Green Refugee type and released to the seed trade in 1935 as a canning variety, was found hardy and productive under southern conditions. In numerous yield tests the new variety outyielded consistently Stringless Black Valentine, the dominant variety of the South at present. Yield differences were most pronounced during the hot, humid summer months when the yield of U. S. No. 5 Refugee was low but that of Stringless Black Valentine often approached crop failure. The high quality and hardiness of U. S. No. 5 Refugee are believed to warrant its more extensive use in the Southern States for canning, market-garden, and home-garden purposes.

El pepinillo "Puerto Rico No. 39" [Puerto Rico No. 39 cucumber], A. ROQUE (*Agr. Expt. [Puerto Rico Univ. Sta.]*, 1 (1941), No. 6, pp. 5-6).—Information is given on a new station variety possessing resistance to mildew and also high yielding capacity.

Production of tomatoes for canning and manufacturing, J. H. and W. R. BEATTIE and S. P. DOOLITTLE (*U. S. Dept. Agr., Farmers' Bul.* 1901 (1942), pp. 11+37, figs. 16).—This supersedes Farmers' Bulletin 1233 (E. S. R., 46, p. 139) and contains general information regarding the growing of tomatoes. Among subjects discussed are the cultural requirements of the tomato, varieties, methods of growing plants, control of various insect and disease pests, harvesting, grading, etc.

Production of tomatoes for canning in Oklahoma, H. B. CORDNER (*Oklahoma Sta. Misc. Pub.* 5 (1942), pp. 7).—Useful information is presented on the methods of growing plants, varieties, care of the soil, methods of harvesting, etc.

Product varietal studies from a plant breeder's point of view, B. D. DRAIN. (Tenn. Expt. Sta.). (*Refrig. Engin.*, 43 (1942), No. 4, pp. 221-222, 244, figs. 4).—The role of certain specific fruit varieties in commercial production is stressed, with the suggestion that horticultural plant breeders now have the problem of developing varieties adapted to freezing preservation. Some of the desirable characters needed in fruits and vegetables designed for freezing are outlined, and the progress of the station in meeting some of these problems is discussed.

Fruits for the family, S. W. EDGECOMBE (*Iowa Sta. Bul.* P42, n. ser. (1942), pp. 413-420).—Brief information is presented on cultural requirements, the need of healthy planting stocks, protection from low-temperature injury, pruning at the time of planting, protection from various pests, and desirable varieties.

Studies concerning the supply of available potassium in certain New York orchard soils, W. REUTHER ([*New York*] *Cornell Sta. Mem.* 241 (1941), pp. 51, figs. 13).—Analyses of the foliage collected from numerous New York orchards, both normal and scorched, revealed an abnormally low content of K in the leaves of the scorched trees. Analyses showed a low level of K availability, as indicated by exchangeable and Neubauer values, in the soil collected beneath

trees exhibiting scorch. Fertilization with K of young fruit trees affected with scorch failed to increase trunk growth the next season, but did yield some evidence of an improved condition of the foliage. The K content of the foliage was increased in almost all cases by applications of K fertilizers. Farm manure was also effective in several instances in improving the appearance of the foliage and the general vigor of severely scorched trees. The manure treatment tended to increase the K content of the foliage.

Greenhouse studies with apple seedlings grown in pots of soil collected in selected orchards showed favorable responses to K with certain types of soil. Only in a very broad, general way did the response appear to be correlated with the level of K availability of the soil as indicated by the exchangeable and Neubauer values and with the K content of the foliage. A close correlation was found between the native exchangeable K of the soil and the percentage of K in the dry matter of foliage from control pots receiving no K fertilizer. It was evident that foliage scorch of fruit trees in New York is due in some cases at least to a deficiency of available K.

Orchard covers and their relation to soil conservation, R. C. COLLISON and E. A. CARLETON (*New York State Sta. Bul. 701 (1942), pp. 33*).—Continuous clean cultivation of orchards was found to deplete both soil N and organic matter, and even on a slope of 8 percent resulted in serious soil and water losses. Weeds were beneficial in conserving N and in accumulating organic matter. Rye seeded in the fall and plowed under in spring was effective in reducing soil and water losses. The effect of soil organic matter in reducing erosion is believed due to stabilization of the soil aggregates. Early June seeding of the cover crop was more desirable than fall seeding, both in N and organic matter conservation, particularly when the cover crop was allowed to stand through the winter. Soybeans, sweetclover, vetch and rye, and oats and sweetclover were desirable cover crops when sowed early and allowed to remain over winter. Soybeans, although not outstanding in building soil N, were effective in erosion control and water conservation due largely to their snow-retention properties. A snow-retaining cover and the snow itself were helpful in rainfall absorption and reducing soil erosion. Permanent grass sod, conceded an almost perfect erosion control, conserved soil N and organic matter, especially the latter. Continuous alfalfa conserved and accumulated both N and organic matter. Neither grass nor alfalfa increased N or organic matter in the subsoil. Considered as different types or systems of orchard soil management, the covers and their soil conservation are discussed with regard to their relation to the soil and to the trees. Mulches are treated from the same standpoint. Practical recommendations are given.

Investigations on the cause and control of biennial bearing of apple trees, C. P. HARLEY, J. R. MAGNESS, M. O. MASURE, L. A. FLETCHER, and E. S. DEGMAN (*U. S. Dept. Agr., Tech. Bul. 792 (1942), pp. 58, figs. 8*).—In work conducted at Wenatchee, Wash., a much higher starch percentage and a slightly lower percentage of free reducing substances were found in tissues initiating blossom buds as compared with similar tissues forming leaf buds. Defoliation of off-year main leaders of biennial-bearing Yellow Newtown trees indicated that the substance responsible for the initiation of flower buds is synthesized mainly in leaves borne by the immediate new spur growth. Differentiation of flower primordia in the bud meristem appeared to bear a quantitative relationship to the foliage area. There was a strong indication that roots and other structural tissues make the first demand for the substance which carries the blossom-forming factor in trees devoid of fruit. When young fruits are present, they make a prior demand over all competing tissues for this blossom-forming principle. The time of bud dif-

ferentiation depends apparently on the advent of terminal or apical bud formation. Short spurs formed buds early and longer spurs formed buds late in the season. Buds from vigorously growing trees could be influenced to initiate flower buds over a longer period than those from less vigorous trees. The earlier that leaf-fruit adjustments were made, the greater was the response in blossom buds formed. The duration of the effective period was less in varieties of biennial-bearing tendency than in those of annual-bearing habits. Biennial bearing was definitely broken and annual production maintained thereafter by leaf-fruit adjustments and by early fruit thinning.

In the Potomac Valley, moderately vigorous York Imperial trees thinned during the bearing year formed sufficient blossom buds for a crop the next year when thinning was completed within 30 days after full bloom and when 10 or more growing points, carrying an average of 13-15 sq. in. of leaf area, were available for each remaining fruit. There was a lesser effect from thinning 35-40 days, and no consistent effect after 50 days beyond full bloom. The greater the vigor of the tree, the more marked was the response to fruit thinning. Yellow Transparent, an early-maturing variety, formed blossom buds on only about 10 percent of its spurs when thinned within 30 days after full bloom. Stayman Winesap, a partially biennial variety, showed some response in increased blossom buds up to 50 days beyond full bloom. Completely biennial Jonathan trees showed some response up to 37 days, but not to the extent of a full crop the next year. Earliness of thinning appeared more important than degree of thinning under eastern conditions.

Controlled atmosphere storage for Jonathan apples as effected by restricted ventilation, H. H. PLAGGE. (Iowa Expt. Sta.). (*Refrig. Engin.*, 48 (1942), No. 4, pp. 215-220, figs. 4).—Jonathan apples were stored in sealed chambers, the CO₂ contents of which were maintained at different levels ranging from 10-12 to 3-4.5 percent. Two temperatures, 35°-36° and 31°-32° F., were utilized. The relative humidities were close to saturation. The results indicated that at 35°-36° a CO₂ concentration of approximately 7 percent gave best results, as measured in color development, flavor, freedom from Jonathan spot, and decreased shriveling. At 32°, at the two higher CO₂ levels, brown heart and soggy breakdown were present, suggesting a hazard in the use of CO₂ at the lower temperature levels.

Factors affecting peach tree longevity in Georgia, E. F. SAVAGE and F. F. COWART (*Georgia Sta. Bul.* 219 (1942), pp. 15, figs. 6).—Of various causes, winter injury in its several forms was found the principal factor affecting the longevity of peach trees in Georgia. Once a peach tree was winter injured very little could be done, but the use of complete fertilizers in sufficient amounts to keep the trees growing vigorously helped to prevent the winter injury. Peach borers caused considerable damage, but due to improved methods of control are considered to be no longer as important as in earlier years. Soil erosion is ranked as slightly ahead of the peach borer as a cause of peach tree losses. The authors suggest that efforts be made to control erosion by such means as contour plantings, terracing, and the growing of cover crops. The soil should be of a character to permit the deep rooting of the peach trees. In general, southwest slopes were not desirable because of increased hazard from winter sunscald. Varieties of established hardiness and inherent longevity should be chosen for planting. Pruning was a factor in longevity since severe pruning limited growth of the root system and thus affected adversely the life of the tree. Peach trees affected with phoney disease or with crown gall should be removed and destroyed.

Handling peach trees after winter killing of fruit buds, T. J. TALBERT (*Missouri Sta. Cir.* 221 (1942), pp. 7, figs. 3).—General information is presented

on the treatment of peach trees following winter killing of the flower buds. Among the subjects discussed are pruning, fertilizing, and general cultural care.

Blackberries and dewberries, G. L. SLATE (*New York State Sta. Cir.* 193 (1942), pp. 17, fig. 1).—General information is presented on location of plantings, soil preparation, varieties, propagation, cultivation, pruning, training, control of diseases, etc.

Pruning grapevines, H. J. SETICK and J. H. CLARK (*New Jersey Sta. Cir.* 423 (1942), pp. 8, figs. 6).—Information is presented on the underlying principles and practices of pruning grapevines.

Effect of cultivation and sod treatment on root development of the tung tree, O. A. LEONARD (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 4, p. 7).—Much greater root development was observed in tung trees grown under continuous cultivation than under permanent sod. However, in the upper 2 in. of soil under sod there was a higher concentration of roots. The author concludes that the detrimental effects of sod are due to competition with grass roots for moisture and nutrients. Where trees were grown 3 yr. under cultivation and then under permanent sod the harmful effects were not so marked, but there was again a tendency for roots to accumulate near the surface. Analyses of the soil air showed identical concentrations of O₂ and CO₂ under sod and under tillage.

Propagation of hemlock by cuttings, W. L. DORAN. (Mass. Expt. Sta.). (*Amer. Nurseryman*, 74 (1941), No. 6, pp. 18-19).—Studies with hemlock cuttings, plant materials that root with difficulty or not at all without treatment, showed good response to both naphthaleneacetic acid and indolebutyric acid. It is suggested that propagators working with late fall cuttings of hemlock use naphthaleneacetic acid, at least for cuttings of the current season's growth. When cuttings of the last 2 years' growth are used, indolebutyric acid in relatively high concentrations is sometimes highly effective.

Germination failures of the magnolia in Puerto Rico, M. T. COOK (*Jour. Agr. Univ. Puerto Rico [Univ. Sta.]*, 25 (1941), No. 4, pp. 51-53, fig. 1).—Finding great difficulty in obtaining germination of magnolia seeds, the author made a study of the development of the embryo sac and embryo. It was found that many of the ovules never developed an embryo sac, while others developed empty sacs. The pollen appeared to be of a normal character.

Plants of ornamental value for the Rio Grande Valley of Texas, W. H. FRIEND (*Texas Sta. Bul.* 609 (1942), pp. 156, figs. 49).—Herein are presented descriptions of the appearance and habits of growth of various native and ornamental plants found suitable for the lower Rio Grande Valley in the landscaping and beautification of the area. The report includes also information regarding annual and perennial flowers as well as a number of valuable plants that may be handled as perennials even though they are sometimes too tender for treatment as shrubs.

Home flower gardens, J. E. SMITH (*Missouri Sta. Cir.* 223 (1942), pp. 11, figs. 2).—This general circular presents information on soils, fertilizers, methods of sowing seed, selection of desirable varieties, cultural care, watering, cutting flowers, and insect and disease control.

FORESTRY

Distribution of roots of certain tree species in two Connecticut soils, G. I. GARIN (*Connecticut [New Haven] Sta. Bul.* 454 (1942), pp. 97-167, figs. 13).—Studies of the root distribution of five species, namely, white pine, red pine, Norway spruce, white ash, and red oak, planted in 1933 in mixture on Merrimac loamy sand and Charlton fine sandy loam, showed pronounced species and soil responses. Roots of trees in Merrimac soil penetrated into deeper soil layers

than in the Charlton sandy loam. The lateral spread was also greater in the Merrimac soil. The number of tree roots decreased with increasing depth below the soil surface, this situation being more pronounced in the Charlton soil. Large roots were present in proportionately greater numbers in the Merrimac than in the Charlton soil, but the total number of small roots was significantly greater in the Charlton soil.

As to species, white pine had the greatest number of roots of all sizes in both soils. Red pine ranked next to white pine in number of roots, but had considerably fewer roots. White ash ranked third in number of roots, and the proportion of small roots was considerably greater in the ash than in any other species. Norway spruce was next to lowest in the total number of roots of all sizes. Red oak had the fewest roots of all five species in both soils. The type and distribution of root growth is discussed for each species.

In general conclusion, the author points out that the period of root competition in the forest may precede or follow the closing of the tree crowns, depending on the quality of the site. Root competition must frequently be the most important factor of suppression or dominance in a forest stand.

DISEASES OF PLANTS

The Plant Disease Reporter, [April 1 and 15, 1942] (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr.*, 26 (1942), Nos. 6, pp. 125-157, figs. 2; 7, pp. 159-173, figs. 2).—In addition to the host-parasite check-list revision, by F. Weiss (Nos. 6, *Quercus* concluded, and 7, *Randia* to *Rhododendron*), the following items are noted:

No. 6.—Western X-disease of peach in Oregon, by S. M. Zeller, J. R. Kienholz, and C. E. Owens; buckskin disease of cherry in southern Oregon, by S. M. Zeller and C. B. Cordy; charcoal rot (*Rhizoctonia bataticola*) on potatoes in Illinois, by G. H. Boewe; cotton rust in Arizona, by J. T. Presley; relative prevalence and geographic distribution of various ear rot fungi in the 1941 corn crop, by P. E. Hoppe; rice blast (*Piricularia oryzae*) in Arkansas, by E. M. Cralley and C. R. Adair; plant diseases in Montana, including *Phoma* infection of sugar beets planted in the fall, by M. M. Afanasiev, and violet root rot of potatoes and sugar beets, and *Sclerotinia* on Great Northern beans, both by H. E. Morris; brief notes on the development of apple scab in Pennsylvania, maturation of perithecia of the apple scab fungus in Missouri, 1942, and a new fungus (*Phyllachora cynodontis*) on what is noted in No. 7, p. 173, as *Muhlenbergia schreberi* in Louisiana; and the use of dinitro-o-cresol as an eradicant spray for fruit diseases, with special reference to apple scab and raspberry anthracnose, by E. G. Sharvelle.

No. 7.—Spergon (chloranil) and scurf (*Monilochaetes infuscans*) control of sweetpotatoes, by R. H. Daines; notes on apple scab in New York; further evidence of the fungicidal value of Spergon, by R. H. Davy; a rose understock resistant to root knot nematode, by E. W. Lyle and G. E. Altstatt; and the correction referred to above.

[Plant disease studies by the New Jersey Stations] (*New Jersey Stat. Rpt. 1941*, pp. 38-39, 48, 55-56, 57, 59, 60, 64-65, 70, 102, 105).—Brief reports of results are presented on the following: Ground sprays applied during the late dormant period to replace foliage sprays for apple scab control, safety of copper fungicides and substitutes therefor, reduction of double blossom disease of dewberries by removal of affected buds, danger in planting tomatoes on soil where bacterial wilt (*Phytophthora solanacearum*) occurred the preceding year (coop. U. S. D. A.), losses from sweetpotato *Rhizopus* soft rot and control by borax dip, wide differ-

ences found to exist among sweet corn varieties in susceptibility to smut, cabbage club root control by CaCO_3 , alfalfa wilt control by development of resistant varieties, Cu-lime dust effective on potatoes where foliage diseases are not a factor, control of chlorosis due to Fe deficiency in pin oaks by tree injections, and dying back of branch tips of American holly found due to fungus invasion (probably *Fusarium solani martii*).

[Phytopathological studies by the New Mexico Station] (*New Mexico Sta. Rpt. 1941*, pp. 61-62, 76, 79).—Notes on research progress are included relative to segregation and evaluation of factors contributing to the development of pink root rot and associated bulb rot and false blight diseases of onions produced for seed; effects of various potato seed treatments for *Rhizoctonia* on germination, disease control, and yield; and testing sugar beets for curly top resistance.

[Plant disease studies by the South Carolina Station] (*South Carolina Sta. Rpt. 1941*, pp. 56-67, 127-131, 161-163, 163-165, 173-175, figs. 5).—Brief reports of progress by C. H. Arndt, R. Weindling, W. B. Albert, W. B. Keller, G. M. Armstrong, B. S. Hawkins, C. C. Bennett, N. Allen, H. N. Pollard, T. W. Graham, J. M. Jenkins, Jr., C. N. Clayton, and C. J. Nusbaum are included on cotton seedling diseases; surveys of diseases of corn and of cotton seedlings and bolls (coop. U. S. D. A.); mineral nutrition and *Fusarium vasinfectum* resistance in a susceptible and a wilt-resistant cotton variety; cross-inoculations with *Fusarium* wilt organisms; tests of new varieties of wilt-resistant cottons; self-pollination and selection of wilt-resistant lines of Super 7 cotton; an adjustable spray boom for treating flue-cured tobacco and control of downy mildew (blue mold), including tests of copper-oil and organic sprays and paradichlorobenzene gas; root knot and meadow nematode studies; breeding cucumbers for downy mildew resistance; potato seed treatments and source of seed v. disease incidence; and control of *Cercospora sesami* blight of benne (*Sesamum indicum*).

Plant pathology (*Tennessee Sta. Rpt. 1940*, pp. 94-97, 98, 99).—Brief reports are presented, by C. D. Sherbakoff, R. A. Hyre, M. C. Richards, and D. H. Latham, on progress with studies of resistance to *Fusarium* wilts of watermelon, tomato, and cotton (coop. U. S. D. A.); wheat root rot and scab resistance; testing of strawberry black root-tolerant selections; spraying and dusting for *Alternaria* blight of tomato; testing of eradicant sprays and various "insoluble" copper fungicides; and control of wildfire and other diseases of tobacco.

[Phytopathological studies by the Washington Station]. (Partly coop. U. S. D. A. and West. Wash. Expt. Sta.). (*Washington Sta. Bul. 410 (1941)*, pp. 66-67, 82-92, 114-115, 121).—Progress reports are given by E. L. Overholser, F. L. Overley, D. F. Allmendinger, A. L. Kenworthy, F. D. Heald, L. K. Jones, G. A. Haber, J. D. Menzies, L. Campbell, C. D. Schwartz, C. S. Holton, E. F. Gaines, G. W. Fischer, and D. J. Crowley on soil treatments for cork spot of Anjou and black end of Bartlett pears; plant disease survey of the Yakima Valley and of the State as a whole, including a report of the prevalence of the X-virus disease of peach; cause of the witches'-broom disease of alfalfa; virus diseases of cineraria; virus yellows of carnation; diseases of greenhouse plants; incidence of mosaic on various brambles; virus diseases of potato and other plants of the group; fungus causes and control of apple rots; control of black root of sugar beet; breeding and selection for resistance to bean rust; "running out" diseases of strawberry; new races of *Tilletia tritici* and *T. levis* on wheat; inoculations of oats and other *Avena* spp. with races and collections of *Ustilago levis*, *U. avenae*, and *U. perennans*, and the conclusion that the last two are identical and should be designated *U. avenae*; diseases of forage grasses, including incidence, host specialization, seed treatments, and breeding for resistance; and fungicides for cranberry bogs.

Studies on the viroplasm hypothesis, J. JOHNSON. (Univ. Wis. coop. U. S. D. A.). (*Jour. Agr. Res. [U. S.], 64 (1942), No. 8, pp. 443-454, figs. 7*).—According to this hypothesis, virus diseases may originate when some part of the living protoplasm of one species is properly introduced into living cells of another species where the foreign protoplasm may find compatible growth conditions. To test the theory, extracts from 122 apparently healthy species of legumes representing 50 genera were transferred chiefly to the bean plant (*Phaseolus vulgaris*). A response interpreted as allergic in nature and two new viruses were identified from the tests. No claim, however, is here made of any actual proof of the validity of the hypothesis.

Effect of trace elements on growth of *Aspergillus niger* with amino acids. R. A. STEINBERG. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 64 (1942), No. 8, pp. 455-475*).—In a survey of the assimilability of amino acid N and C by *A. niger* in synthetic nutrient solutions at 35° C. for 4 days, N in alanine, arginine, aspartic acid, glutamic acid, glycine, hydroxyproline, ornithine, and proline proved fully equivalent to inorganic N. Serine, threonine, and tryptophane gave yields corresponding to 50 percent utilization and the balance to far less. None of the amino acids fully effective as sources of N contained a stable cyclic group or branched C chain, nor were they among those incapable of synthesis by rats. Assimilability of amino acid N was affected by use of a poor source of C (glycerol), though the characteristic amino acid utilization pattern was still recognizable. Cysteine inhibited growth with both inorganic and amino acid N and enhanced starch formation. N utilization was very poor with cysteine, cystine, and homomethionine, and only fair with methionine. In contrast to the other S-containing amino acids, homomethionine could not serve as a source of S. Availability of cysteine N was not improved by oxidation of its mercapto group or replacement of mercapto H.

Only proline, aspartic acid, glutamic acid, ornithine, and arginine were at all effective as sources of C, C utilization factors being 0.22, 0.21, 0.23, 0.1, and 0.1, respectively. These were also fully effective as sources of N. Effectiveness as C sources increased synergistically in admixtures. A mixture of proline, glutamic acid, and ornithine had a C utilization factor of 0.82 as compared to 1.17 with sucrose. Utilization of C in this mixture was not increased by adding alanine, arginine, aspartic acid, glycine, or hydroxyproline. Increasing the length of the C chain in the α -amino monocarboxylic acids was accompanied by a rapid decrease in the assimilability of their N. Introduction of an amino group at terminal C or its oxidation to carboxyl considerably increased the assimilability of both N and C in the four- and five-C acids.

Alanine, arginine (ornithine), aspartic acid, glycine, glutamic acid, and proline (hydroxyproline) are considered to be the first-formed amino acids in the synthetic process and are therefore called "primary" amino acids. These were considered probable precursors of the other amino acids synthesized by the fungus, which are termed "derived" amino acids. C assimilation studies, however, indicated that α , δ -derivatives of valeric acid (glutamic acid, ornithine, proline) are actually the first of the primary acids formed, the balance being products of relatively simple interconversions. Growth responses to structural modification in glycine and alanine used as sources of N closely paralleled the results of analogous in vitro studies reported for enzymatic action on dipeptides. N utilization depended directly on the presence of an α -amino group and of α , β , and carboxyl H. Introduction of substituents for α , β , or carboxyl H inhibited assimilability of N, as did also reduction of carboxyl or a shift of the amino group to the β C atom. The trace elements Fe, Zn, Cu, Mn, Mo, and Ga were required with amino acid N as with inorganic N. Minute amounts

of these elements were tenaciously retained by the amino acids, as compared to inorganic and urea N, during purification of the nutrient solution with CaCO_3 . There are 36 references.

Temperature as it affects spore germination in the presence of copper and sulphur. W. D. McCLELLAN. (Cornell Univ.). (*Phytopathology*, 32 (1942), No. 5, pp. 394-398, fig. 1).—Using 3° intervals from 6° to 33° C., the effects of temperature on the fungicidal activity of CuSO_4 and a particulate S were studied, CuSO_4 being employed against conidia of *Sclerotinia fruticola* and *Alternaria solani* and urediospores of *Uromyces caryophyllinus*, and S against conidia of *S. fruticola*, *Venturia inaequalis*, and *Sphaerotheca pannosa rosae*. The agents were applied to glass slides (rose leaflets for *Sphaerotheca*) by a spray settling tower, after which drops of the spore suspension were applied (dusted on leaflets for *Sphaerotheca*), and the percentage germination was determined after 24 hr. Parallel series were run at the same temperatures, using unsprayed slides and leaflets. Both CuSO_4 and S were found to be least effective in reducing spore germination at the optimum spore germination temperatures of the organisms employed and more effective both above and below these points.

Studies on the mechanism of fungicidal action.—I, Preliminary investigation of nickel, copper, zinc, silver, and mercury. A. F. PARKER RHODES (*Ann. Appl. Biol.*, 28 (1941), No. 4, pp. 389-405).—Proofs are offered of two theorems relating the chemical reactions of toxic substances to certain statistics of the distribution of the tolerance of fungus spores to them. From the results of using these theorems, it was inferred that Cu is absorbed by the spores more readily in the form of the monohydrated dithioureocuprous ion, or a related compound, than as the simple cupric ion; certain cupric complex compounds tested appeared to require decomposition before absorption. Zn is more readily absorbed as the dithioureozinc ion. Ag in the form of the dithioureargentous ion requires decomposition (at least in one case) before absorption. Hg in the form of the tetrathlioureomercuric ion requires decomposition before absorption. All these conclusions are put forward only as the simplest explanation of the facts. A suggestion is made relating the observed distribution of tolerance to the Langmuir adsorption equation. Evidence is presented that temperature fluctuations affected the variability less than some other statistics and failed to induce any significant anomalies in it.

Relation of particle size to fungicidal value and tenacity of two "insoluble" copper fungicides. R. A. HYBE. (Tenn. Expt. Sta.). (*Phytopathology*, 32 (1942), No. 5, pp. 388-393, fig. 1).—Using a laboratory method involving the settling tower and slide-moist-chamber technic for testing the relation of particle size to fungicidal value and tenacity of Cu carbonate and "Tri-Basic" Cu sulfate against *Macrosporium sarcinaeforme*, the fungicidal value and tenacity were found to increase as the size of the particles decreased, thus indicating a method for improving these materials as protective fungicides.

Reduction in fungicidal value of copper compounds by organic materials. J. W. HEUBERGER and J. G. HORSFALL. (Conn. [New Haven] Expt. Sta.). (*Phytopathology*, 32 (1942), No. 5, pp. 370-378).—In a laboratory study of the influence of various organic materials on the fungicidal value of bordeaux, CuSO_4 , Cu oxychloride, and red and yellow cuprous oxide, two experimental designs were used, viz, the toxic 50 percent deposit of Cu was held constant and the deposit of organic material varied, and the deposit of organic material was held constant and the deposit of Cu varied. In the first case the effect of the varying organic material on fungicidal value at the LD50 point was measured, whereas in the second one a measure was obtained of the increase in Cu deposit necessary to

give LD50 in the presence of unit deposit of organic material. Materials containing considerable amounts of protein (such as derris powder, pyrethrum powder, soya flour, and alfalfa meal) reduced the fungicidal value. The Cu compounds were all affected similarly at a definite point (LD50). Materials containing little or no protein (such as cornstarch and activated charcoal) did not reduce the fungicidal value. The reduction in fungicidal value by protein-containing materials is believed due to a reaction between the toxic Cu and the protein, thus decreasing the amount of toxic Cu available to the spores.

Nova substancia anti-criptogamica: Sugestões para o estudo do aproveitamento, na lavoura, de novo sal de cobre [New fungicidal substances: Suggestions for studying the application of a new copper salt in agriculture], N. MARAVALLHAS (*Rev. Agr. [Brasil]*, 16 (1941), No. 3-4, pp. 182-184).

Methods of tree injection, C. MAY. (U. S. D. A.). (*Trces Mag.*, 4 (1941), No. 6, pp. 7, 10-12, 14, 16, figs. 4).—An illustrated review (21 references).

A new fungous parasite on dung-inhabiting Ascomycetes, M. L. LOHMAN (*Mycologia*, 34 (1942), No. 1, pp. 104-111, figs. 15).—On *Phlyctochytrium lippsii* n. sp.

Phacidium nigrum, E. K. CASH. (U. S. D. A.). (*Mycologia*, 34 (1942), No. 1, pp. 59-63, fig. 1).—A supplementary description and notes on this fungus attacking leaves and twigs of *Xolisma ferruginea*.

Root rot of Chamacyparis caused by a species of Phytophthora, C. M. TUCKER and J. A. MILBRATH. (Oreg. and Mo. Expt. Stas.). (*Mycologia*, 34 (1942), No. 1, pp. 94-103, figs. 14).—This root rot of *C. lawsoniana* in Oregon and Washington is attributed to *P. lateralis* n. sp. It invades the young roots, eventually girdling the trunk. Characteristic color changes of the leaves accompany root and stem destruction, and infected trees are killed. The disease has also been identified on *C. lawsoniana alumi*, *C. lawsoniana erecta*, and *C. obtusa gracilis*.

Studies on the growth in soil and the parasitic action of certain Rhizoctonia solani isolates from wheat, I. D. BLAIR (*Canad. Jour. Res.*, 20 (1942), No. 3, Sect. C, pp. 174-185, pl. 1, fig. 1).—Measuring the growth of *R. solani* in soil by a modified glass slide technique, the extent of growth of 11 isolates after 6-day and 12-day periods was less in vertical than in radial directions. Comparison of the radial growth of a faster and a slower growing isolate showed that the extent of growth decreased with depth, being distinctly greater at 2 than at 6 in. The disease rating for each of 10 isolates tested on wheat was greater in natural than in steam-sterilized soil, and with an inoculum-soil ratio of 1:6 than of 1:3. Addition of cellulosic material to unsterilized soil reduced the parasitic action of all isolates. Two distinct types of injury were noted, viz, a severe root injury resulting in reduced plant growth, and a girdling of the coleoptile or lower stem tissue usually without adverse effects on plant growth. The first type was induced by two slow-growing isolates from England, and the second by faster growing Canadian strains. On the basis of these differences it is suggested that the root-injuring forms be regarded as a variety of *R. solani*.

The morphological distinction between Urocystis gladioli and Papulaspora gladioli, H. H. HORSON (*Mycologia*, 34 (1942), No. 1, pp. 52-58, fig. 1).

Studies on the Ustilaginales of the world, II, G. L. ZUNDEL. (Pa. State Col.). (*Mycologia*, 34 (1942), No. 2, pp. 123-127).—Continuing this series on smut fungi (E. S. R., 82, p. 201), the author describes new species of *Ustilago*, *Sphacelotheca*, *Sorosporium*, *Tilletia*, and *Entyloma*. The Latin descriptions are by E. R. Dengler.

Root-knot: Suggestions for its prevention, control, J. A. PINCKARD (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 4, p. 2, fig. 1).—The success of home

and farm gardens in southern latitudes is greatly limited by this nematode. Suggested rotation practices and sanitation measures, and tolerant kinds and varieties of vegetables and fruits, are presented.

Male-sterile barley for study of floral infection, C. A. SUNESON and B. R. HOUSTON. (U. S. D. A. and Calif. Expt. Sta.). (*Phytopathology*, 32 (1942), No. 5, pp. 431-432).—It is shown that the open glumes of male sterile barley plants afford a means of mass inoculation of the flowers by dusting into them spores of *Helminthosporium gramineum* (stripe) or *Ustilago nuda* (loose smut). Inoculations with the stripe organism resulted in infection percentages equally as high as those obtained by sprouting barley on a mycelial mat of the stripe organism, whereas a relatively low percentage of infection was secured when loose smut spores were dusted into the open glumes.

Soil conditions and the take-all disease of wheat.—VII, Survival of *Ophiobolus graminis* on the roots of different grasses, S. D. GARRETT (*Ann. Appl. Biol.*, 28 (1941), No. 4, pp. 325-332).—In continuation of the series (E. S. R., 86, p. 640) it was found, as a result of direct inoculation tests and sowing grass seed in inoculated soil, that whereas all 16 species propagated *O. graminis* to some extent as compared with a negligible survival of the fungus in fallow soil and under clover, there were notable differences in its longevity under the different grasses. The resistance of *Phleum pratense* was confirmed, and seeds mixtures employing this grass and *Avena elatior* in place of *Lolium* spp. are suggested for use on heavily infested land.

The colonization of buried wheat straw by soil fungi, with special reference to *Fusarium culmorum*, A. G. WALKER (*Ann. Appl. Biol.*, 28 (1941), No. 4, pp. 333-350, figs. 11).—*F. culmorum* and *Penicillium* spp. were numerically the most important organisms isolated, at least during the first 5 mo. of incubation on the straw in the soil. Both groups of fungi, together with others, appeared generally to be present in the decomposing straw, but the method of preliminary surface sterilization of the straw appeared to decide which organism produced a colony on the isolation plate. *F. culmorum*, a rapid vigorous grower, exhibited low resistance to the more severe sterilizing agents (e. g., HgCl_2 , AgNO_3), but developed better after surface sterilization of the straws with Ca hypochlorite, a mild agent, and best of all after mere washing with sterile water. After these mild agents the *Penicillia* were apparently crowded out by the more vigorous *F. culmorum*, but they were very tolerant of the more severe agents and after the longer period of treatment were often the only organisms developing. The pathogenicity to wheat seedlings of *F. culmorum* isolates from decomposing wheat straw was found comparable with that of isolates from diseased cereal plants.

A vegetable and field crop seed treatment outline for Mississippi, J. A. PINCKARD (*Mississippi Sta. Cir.* 105 (1942), pp. 11).—"The purpose of this circular is to describe methods and materials which have proven valuable to others in their attempts to prevent disease losses among seedling plants." The materials and methods are tabulated alphabetically by crop plants, and the fungicides are listed alphabetically with accompanying discussions and directions.

A new virus disease of bean, W. J. ZAUMYER and L. L. HARTER. (U. S. D. A.). (*Phytopathology*, 32 (1942), No. 5, pp. 438-439).—A new bean virus, designated as bean virus 4 and unrelated to bean virus 1, was isolated from beans grown in Maryland, Louisiana, and California. All varieties thus far tested have proved susceptible, some responding to local lesions and the others to systemic mottle infection. The virus was inactivated between 90° and 95° C., was infectious at 1 500,000 dilution, and retained its infectivity after aging for 165 days at 18°.

Natural mode of entrance of fungi into corn ears and some symptoms that indicate infection, D. KOEHLER. (Ill. Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 64 (1942), No. 8, pp. 421-442, pl. 1, figs. 7).—By plating on agar medium the normal unsterilized tissues from selected parts of corn ears at various developmental stages and mature surface-sterilized whole and dissected corn kernels, and preparation of histological sections of corn kernels, *Fusarium moniliforme* was proved to be the most prevalent fungus in the ears. In nearly all cases it had entered in the region of the silks, contaminated the kernels, and spread to the pedicels, vascular cylinder, and finally the shank. Internal kernel infection in sound-appearing ears did not become established until the ears were approaching maturity. A large part of the *Cephalosporium acremonium* infection occurred in the same way, but in another type of infection the fungus made contact with the lower half of the kernel surface, apparently progressing down the ear in the area where the glumes are located. A smaller portion reached the kernels via the butt of the cob, vascular cylinder, and pedicels, and internal infection became established when the ears were approaching maturity. *Gibberella zeae* infection practically all started at the tips of the ears, progressing downward most rapidly in the region of the silks. *Diplodia zeae* and *Nigrospora* spp. infected by entering at both the tip and butt of the ear, and penetration of the butt resulted very largely from local infections on the shank. *D. zeae* caused a more active and generalized rot in the wake of the advancing mycelium than any of the other fungi. A *Monilia* sp. was very prevalent in some seasons, entering the silk region, progressing over the kernel surfaces and invading the pedicels and vascular cylinder, but not causing internal kernel infection. *Penicillium* infections, with minor variations, behaved much like *F. moniliforme* infections.

Exposure from incomplete husk protection or slight injury by earworms at the tip of the ear caused marked increases in infection by some fungi. Discoloration at the butt of the cob with broken shank was a strong indication of infection at the butt and also of kernels in ears that had been previously selected for good husk covering and freedom from worm damage. White streaks on the pericarp of kernels proved due to invasion by *F. moniliforme*, *C. acremonium*, or *Nigrospora* spp. The white color was caused by disintegration of cells and consequent loss of transparency and assumption of a chalky appearance.

Varietal susceptibility of peas to marsh spot, H. H. GLASSCOCK (*Ann. Appl. Biol.*, 28 (1941), No. 4, pp. 316-324).—Plat trials (1933-34) indicated that varieties differ in susceptibility to marsh spot, and numerous varieties are tabulated to show their relative reactions. The amount found in commercial crops of seed of numerous varieties of peas grown in East Anglia over an 8-yr. period was supplied by a seed firm, and the relative susceptibility approximated that found in the plat tests noted. Using the percentages of marsh spot and the varietal characteristics given by the firm, it is shown that late-maturing, large-seeded varieties were more severely affected than early-maturing, small-seeded varieties. Roundness of seed was also associated with earliness of maturity and disease resistance.

Classification and nomenclature of the pathogen causing bacterial ring rot of potatoes, J. B. SKAPTASON and W. H. BURKHOLDER. (Cornell Univ.). (*Phytopathology*, 32 (1942), No. 5, pp. 439-441).—On the basis of morphological and physiological characters discussed, and after reviewing the taxonomic history of the species, the authors propose the name *Corynebacterium sepedonicum* n. comb. (Spleckermann and Kotthoff) (E. S. R., 33, p. 146) for the organism of potato ring rot.

Relation of moisture to invasion of tobacco leaves by *Bacterium tabacum* and *Bacterium angulatum*, S. DIACHUN, W. D. VALLEAU, and E. M. JOHNSON.

(Ky. Expt. Sta.). (*Phytophthora*, 1941, 1, figs. 2).—Infection failed to develop in greenhouse or field tests when a suspension of *Phytophthora tabaci* was placed on leaf surfaces even when the leaves were kept moist for some time after inoculation, i. e., the bacteria did not swim through stomata to produce infection. However, infection did occur when a bacterial suspension of *P. tabaci* or *P. angulata* was placed on the surface of water-soaked leaf tissues, sustained water-soaking not being necessary. When the inoculum was applied after the tissues were no longer water-soaked, infection did not occur. Furthermore, when leaves were sprayed (but not water-soaked) with sterile water prior to inoculation, a bacterial suspension then poured on the sprayed surface induced considerable infection. These results are interpreted as meaning that before bacterial infection of tobacco leaves can occur stomata must be open and a liquid passage must exist between the outer leaf surface and the intercellular spaces, or if such passageway does not exist the bacteria must be injected through the stomata.

Aromatic amino acids in strains of tobacco mosaic virus and in the related cucumber viruses 3 and 4, C. A. KNIGHT and W. M. STANLEY (*Jour. Biol. Chem.*, 141 (1941), No. 1, pp. 39-49, figs. 2).—Serological tests with six strains of tobacco mosaic virus and cucumber viruses 3 and 4 as antigens and tobacco mosaic antiserum indicated a close relationship between tobacco mosaic virus and all the viruses tested except the Holmes ribgrass strain and cucumber viruses 3 and 4. Analyses of 12 preparations of tobacco mosaic virus showed the presence of 3.8, 4.5, and 6 percent of tyrosine, tryptophane, and phenylalanine, respectively. The results obtained for yellow aucuba, green aucuba, Holmes masked, and J14D1 strains of tobacco mosaic virus were the same as those for tobacco mosaic virus within experimental error. Pronounced differences were found in the cases of the Holmes ribgrass strain of tobacco mosaic virus and cucumber viruses 3 and 4 for tyrosine, tryptophane, and phenylalanine. An indication of the absence of significant quantitative differences in the nucleic acid component of the viruses was evident in the close agreement of analytical values for P in the various strains. The nucleic acid of all the viruses was of the yeast type. On the other hand, the decided dissimilarities in the protein portions of some of the viruses indicated that the mutation of tobacco mosaic virus to form a new strain may be accompanied by changes in the amino acid composition of the virus. Because of the nature of these changes, it is suggested that a new virus strain arises by a diversion of the synthetic process by means of which the virus multiplies rather than by an alteration of completely formed virus molecules. There are 18 references.

Variations in the cytoplasmic inclusions induced by three strains of tobacco mosaic virus, B. KASSANIS and F. M. L. SHEFFIELD (*Ann. Appl. Biol.*, 28 (1941), No. 4, pp. 360-367, pls. 2).—In 1940 a variety of new forms of inclusions were found in tobacco plants infected with each of three strains of tobacco mosaic virus, viz, the ordinary strain (Johnson No. 1), aucuba mosaic, and enation mosaic. Inoculations were also made in tobacco, tomato, and *Solanum nodiflorum* seedlings. "These new forms were mostly fibrous. The spikelike body reappeared, spindle-shaped bodies, masses of short needlelike fibers, and extremely long coiled fibrous forms occurred. New amorphous forms were also found. All these arose either directly or from pre-existing inclusions of the previously recorded types. Variation in the inclusions produced is not due to mutation of the virus. The type of inclusion is to some slight extent determined by the host plant but seems to be largely controlled by the amount of light and heat available to the host."

A chemical method for the determination of tobacco-mosaic-virus protein in plant extracts, C. H. HILLS and H. H. MCKINNEY. (U. S. D. A.). (*Phyto-*

pathology, 32 (1942), No. 5, pp. 419-423.

mosaicked tobacco leaves is said to be ordinarily 0.6-3 mg. of virus N per 40 cc. of leaf extract. Within this range the error of estimation by the following method was less than 10 percent: Freeze the mosaic tissue, pass through a 1000 chopper, add 1 cc. M/10 phosphate buffer (pH 7) per gram of tissue, thaw, press out extract, and remove solids by "Celite" or by centrifuging at 3,000 r. p. m. The clarified extract is acidified to pH 4.2-4 by cautiously adding M/10 H_2SO_4 and stored in a refrigerator overnight to allow a large portion of the nonvirus protein to precipitate. This precipitate is removed by centrifuging at 3,000 r. p. m. and discarded, the supernatant is acidified to pH 3.4, refrigerated overnight, and centrifuged for 30 min. at 3,000 r. p. m. The precipitate contains the virus protein and a trace of nonvirus protein. In analytical studies this nonvirus fraction is estimated from a blank on an extract of comparable healthy leaf tissue. The accuracy of the method was determined by measuring in a micro-Kjeldahl apparatus the amount of virus-protein N in extracts of healthy tobacco tissue amended by known amounts of purified virus protein.

Use of eradicant sprays for the control of asparagus rust, H. W. ANDERSON, H. H. THORNBERRY, and J. P. FULTON. (Univ. Ill.). (*Phytopathology*, 32 (1942), No. 5, pp. 419-423).—*Puccinia asparagi* is said to have become a serious problem in Illinois in recent years, due to the apparent lack of resistance in the supposedly rust-resistant Mary and Martha Washington varieties. Investigating the possibility of using an eradicant spray, the authors selected sodium dinitro-cresylate (Elgetol) for testing. Applications were made during the dormant season at concentrations of 0.5-2 percent by volume of the commercial material (containing 23 percent of the Na salt) and at the rate of 400-800 gal. per acre. A decided reduction in numbered aecial pustules was evident the following spring in all treated plats, regardless of concentration, dosage, and time of application, and secondary infection was delayed by several weeks in the treated plats.

Downy mildew of lima beans in Colorado, L. L. HARTER and W. J. ZAUMEYER. (U. S. D. A.). (*Phytopathology*, 32 (1942), No. 5, p. 438).—*Phytophthora phaseoli* infection of lima bean has hitherto been restricted in its distribution almost exclusively to the Eastern and Central States. During the summer of 1941, it was found to cause considerable damage in Colorado, losses amounting to as much as 60-75 percent on some varieties. Conidia were abundant, but zoospores and oogonia were not observed.

Experiments on the control of club root of Brassicæ in gardens and allotments: A summary of six years' trials, N. C. PRESTON (*Ann. Appl. Biol.*, 28 (1941), No. 4, pp. 351-359, fig. 1).—In trials of 10 substances, significant practical control was attained with calomel, a Hg-Zn amalgam, and also with the proprietary "Brassisan." It is considered that these substances have certain advantages over $HgCl_2$ which may especially commend them for use in gardens and allotments, but $HgCl_2$ used as a standard of comparison gave consistently better results than the other materials tested.

Preparation and properties of cucumber virus 4, C. A. KNIGHT and W. M. STANLEY (*Jour. Biol. Chem.*, 141 (1941), No. 1, pp. 29-38, fig. 1).—With two exceptions, the general properties of this virus isolated from diseased cucumber plants and purified by differential centrifugation were essentially the same as reported by Bawden and Pirie (*E. S. R.*, 79, p. 343) for virus purified by chemical methods, but its activity was somewhat greater. Analyses of three samples of dry virus indicated an average S content of 0.84 percent, which is about four times the amount found in tobacco mosaic virus and significantly higher than previously reported by Bawden and Pirie for cucumber virus 4. Contrasted to a number of other plant viruses, denatured cucumber virus 4

gave a negative nitroprusside test for S—S and S—H. Nucleic acid was isolated from the virus and found, like that of tobacco mosaic virus, to be of the yeast type. Analytical ultracentrifuge and electron microscope data indicated that the particles of cucumber virus 4 (like tobacco mosaic virus) were rod-shaped, with diameter of 15 μ , length of 275 μ , and molecular weight of around 4×10^7 . Precipitin tests of cucumber viruses 3 and 4 and six strains of tobacco mosaic virus as antigens and cucumber virus 4 antiserum indicated a strong serological relationship between the cucumber viruses, but only a weak relationship between virus 4 and strains of the tobacco mosaic virus group. There are 21 references.

Downy mildew resistance in cucumbers, J. M. JENKINS, JR. (S. C. Expt. Sta.). (*Jour. Hered.*, 33 (1942), No. 2, pp. 35-38, figs. 2).—*Peronospora cubensis* infection, common in many sections of the United States, spreads by wind-borne spores and may be combated by Cu dusts or sprays, but disease-resistant varieties would offer a better method of control. Out of 80 varieties and strains tested (1939), only China and Puerto Rico No. 37 proved highly resistant. These were crossed with Colorado, a good commercial variety, and resistant plants of fairly good commercial type were isolated from the F₂ progenies.

Studies on the mosaic of peppers (*Capsicum frutescens*) in Puerto Rico, A. ROQUE and J. ADSUAR (*Jour. Agr. Univ. Puerto Rico [Univ. Sta.]*, 25 (1941), No. 4, pp. 40-50, figs. 4).—The serious mosaic described is reported to be widely spread throughout the island and to cause leaf mottling, stunting, and fruit malformation. The causal virus was easily transmitted mechanically, and evidence of transmission by *Myzus persicae* was obtained. The virus became inactivated in vitro after 48 hr., and also at 55°-58° C. Infectivity fell off rapidly at dilutions of 1:80 and was rare at 1:100. No serological relationships were found between this virus and those of potato mottle (ring spot strain), potato veinbanding, ordinary tobacco mosaic, and cucumber mosaic. Among 84 pepper varieties tested only two proved resistant. *Nicotiana tabacum*, *N. glutinosa*, *N. bigelovii* varieties *multivalvis* and *quadrivalvis*, and *N. rustica* reacted to inoculation with the virus, whereas *Solanum nodiflorum*, *S. tuberosum*, *Datura stramonium*, *N. repanda*, and *N. sylvestris* failed to develop symptoms. Also, *Cucumis sativus*, *Phaseolus vulgaris*, and *P. lunatus* did not react to the virus.

Some factors affecting the infection of tomato seedlings by *Alternaria solani*, W. D. MOORE. (U. S. D. A. and Ga., Ga. Coastal Plain, N. J., and Ind. Expt. Stas. et al.). (*Phytopathology*, 32 (1942), No. 5, pp. 399-403).—The principal limiting factor in seedling leaf-spot infection was humidity, the critical phase apparently being the number of hours per day in which the atmosphere was near saturation rather than the daily mean relative humidity for any particular period. Given humidity conditions suitable for infection, leaf-spot incidence increased with advance in mean temperature within the range studied (to 82° F.). Appreciable infection developed, however, at mean temperatures below those considered suitable for good tomato seedling growth. Both leaf spot and stem canker increased with the degree of mechanical injury to which the plants were subjected prior to inoculation.

Crown gall on budded fruit trees, E. A. SIEGLER and J. J. BOWMAN. (U. S. D. A.). (*Amer. Nurseryman*, 75 (1942), No. 3, pp. 7-9, figs. 2).—This is a summary of progress made during the past 15 yr. toward a solution of the more practical aspects of the problem of malformations, including those due to crown gall, hairy root, wound overgrowths, or a combination of any of the three; and a preliminary report of the results of two seasons' experiments,

indicating that about 60 percent more clean plum and nazzard seedling trees were obtained as a result of treatments with calomel alone or plus mercuric chloride. It is suggested that interested nurserymen make preliminary tests of the method on a small scale.

Transmissible rough-bark diseases of fruit trees, II. EARL THOMAS. (Univ. Calif.). (*Phytopathology*, 32 (1942), No. 5, pp. 435-436, fig. 1).—The evidence presented (with local examples) appears to indicate the existence of a considerable group of virus infections of woody plants which may be called rough bark diseases. These include psorosis of citrus, measles and other bark symptoms of pome fruits, and diamond cankers of stone fruits.

Heterothallism and variability in *Venturia pirina*, M. H. LANGFORD and G. W. KERR. (Wis. Expt. Sta.). (*Phytopathology*, 32 (1942), No. 5, pp. 357-369, figs. 3).—When the 8 spores of each of 5 asci, isolated in the order of their occurrence in the ascus, were grown in vitro, the 40 isolates were found to comprise 20 biotypes of 2 isolates each, 4 from each ascus. A method was developed for producing the ascigerous stage in vitro. The isolates proved to be hermaphroditic but sexually self-incompatible. The 8 isolates from each ascus comprised 2 groups of 4 isolates each, which were intragroup incompatible but intergroup compatible. Pairings between sets revealed only 2 groups for sexual compatibility. Segregation of factors for sexual compatibility occurred alternatively in the first or the second nuclear division of the ascus. Anjou and Flemish Beauty pear leaves were heavily infected by each of the 16 isolates composing the 2 sets tested. Kieffer and Bartlett were not infected by any of them, but yellowish flecks only were incited (no conidia produced) by all isolates of both sets on Seckel leaves. All isolates of one set induced the flecks on Duchess, but of the other set 4 isolates incited sporulating lesions on Duchess and the other 4 flecks only. It is concluded that combinations are a major source of heritable variation in this fungus. There are 26 references.

The western "X" disease of the peach in Utah: Its etiology and significance, B. L. RICHARDS and L. M. HUTCHINS. (Utah State Agr. Col. and U. S. D. A.). (*Utah Acad. Sci., Arts, and Letters, Proc.*, 18 (1940-41), pp. 13-14).—An abstract.

The successful transmission of psorosis of citrus trees in Florida by bark grafting, A. S. RHODES (*Phytopathology*, 32 (1942), No. 5, pp. 410-413, fig. 1).—Psorosis has been definitely transmitted by bark grafting in 6 of 12 inoculations and the typical bark symptoms of the disease were reproduced, development first being apparent after approximately 3 yr. Even after 3 additional years, however, this slow-developing disease had made very little progress. No bark symptoms of psorosis developed at any points on the five trees used in the experiment other than where inoculations were made, and no evidence of psorosis developed in any of the 6 inoculations where the patch of bark used as the inoculum failed to unite with the tissues of the tree. These inoculations are believed to furnish definite proof that psorosis is an infectious disease which may be transmitted from affected to healthy trees by union of tissues and to confirm the work of Fawcett (E. S. R., 80, p. 505), who demonstrated that the causal agent is a virus.

***Nectria cancri* (Butg.) f. *aurantii*,** AVERNA, R. AVERNA SACCÀ (*Rev. Agr. [Brazil]*, 16 (1941), No. 3-4, pp. 150-160, pls. 2, figs. 2).—On *N. cancri* f. *aurantii* n. f. parasitizing orange trees and *Nectria* sp. attacking lemon trees.

***Phytophthora* crown rot of loquat,** P. A. MILLER. (Univ. Calif.). (*Phytopathology*, 32 (1942), No. 5, pp. 404-409, figs. 3).—The author describes and reports for the first time in the United States a crown rot of the loquat tree attributable to spontaneous infection by *P. cactorum*. The initial brown necrotic

bark cankers at the crown extend upward and laterally until the trunk is girdled, and in advanced stages gradual yellowing of the leaves, defoliation, arrested development of fruit, and a general decline precede the death of affected trees. The pathogenicity of the fungus isolated by various methods was established by inoculations of seedlings. Decortication, followed by a bordeaux wash in the early stages gave effective control.

Current investigations on the control of walnut blight in Oregon, P. W. MILLER. (U. S. D. A. coop. Oreg. Expt. Sta.). (*Oreg. State Hort. Soc. Ann. Rpt.*, 32 (1940), pp. 135-138).—No reduction in incidence of bacterial blight could be detected from use alone or in combination of the following fertilizer salts: NH_4NO_3 , $(\text{NH}_4)_2\text{SO}_4$, $(\text{NH}_4)_2\text{HPO}_4$, $\text{Ca}(\text{NO}_3)_2$, CaSO_4 , and KCl . Used at a sufficiently strong concentration, properly timed and thoroughly applied, copper oxalate gave practically as good control under 1940 Oregon conditions as bordeaux, and without foliage injury. Red cuprous oxide (2-100) plus "Orthex" sticker (1 qt. per 100 gal.) was not as effective as either of the above, but was noninjurious to the foliage. A 6-2-100 bordeaux is recommended for general use in the State, with a mineral oil or oil emulsion (1 pt. oil or 1 qt. emulsion per 100 gal.) added to all prebloom applications to reduce the foliage injury. Copper oxalate may be used where convenience and complete freedom from injury are more important than cost.

Stem rot of tuberous begonia, J. T. MIDDLETON. (Univ. Calif.). (*Bul. Torrey Bot. Club*, 69 (1942), No. 2, pp. 92-99, figs. 2).—This stem rot of *Begonia tuberosa*, described from California, New York, and New Jersey, was found to attack plants of any size or age but to be most severe with high soil and air moisture and moderate to high temperatures. The main symptoms consist of soft, water-soaked lesions of the stem, but root, petiole, leaf, and petal infections are also reported. Both *Pythium intermedium* and *P. ultimum* were found to cause the disease, and their temperature relations are detailed. Inoculations with both fungi were also successful on *B. Lloydii*, but *B. semperflorens* proved susceptible only to *P. ultimum*. These fungi also caused damping-off of tuberous begonia seedlings. Control suggestions are given.

Rough-bark, a virous disease of flowering cherry, J. A. MILBRATH and S. M. ZELLER. (Oreg. Expt. Sta.). (*Phytopathology*, 32 (1942), No. 5, pp. 428-430, fig. 1).—The authors describe this virus disease of the Kwanzan variety of *Prunus serrulata* as causing a roughening and longitudinal splitting of the bark, a shortening of the internodes, and an arching downward of the leaves to form clustered heads. The virus was transmitted by budding through mazzard cherry seedlings, which appear to be symptomless carriers. The common name, rough-bark, is proposed for this new disease, in the number system *Prunus* virus 9 may be assigned to the virus, and the binomial *Rimocortius kwanzani* is suggested for the Holmes system name.

Geranium cutting rot—new light on old trouble, F. A. MCCORMICK. (Conn. [New Haven] Expt. Sta.). (*Florists Exch. and Hort. Trade World*, 98 (1942), No. 11, p. 12, figs. 4).—A note on severe losses due to infection of cuttings by *Thielaviopsis basicola*. Use of disease-free cuttings and clean sand for propagating is advocated.

Phlox resistant to powdery mildew, E. B. MAINS (*Phytopathology*, 32 (1942), No. 5, pp. 414-418, figs. 2).—Selections of perennial phlox (including a number of color types) proving highly resistant to *Erysiphe cichoracearum* were obtained, and through repeated selection several highly resistant lines of annual phlox were also secured. Field evidence indicated that there are several physiological races of mildew which may be differentiated by the reactions of perennial phlox selections to them.

Block rot of garden stocks, R. D. WILSON (*Agr. Gaz. N. S. Wales*, 53 (1942), No. 1, pp. 33-35, 55, fig. 1).—*Bacterium campestre* (= *Phytomonas campestris*), being seed-borne, is spread rapidly in the seedbed. Tests led to the recommendation of a 4-hr. treatment in 10 percent bleaching powder (calcium hypochlorite) for all stock seed not known to be free from black rot, though of course clean seed and seedbed soil are the best insurance against attack.

A new threat to tulips: Stem and bulb eelworm finds a new host, B. G. CHITWOOD and J. H. MACHMER. (U. S. D. A.). (*Florists Exch. and Hort. Trade World*, 98 (1942), No. 11, pp. 9, 15, figs. 2).—A note on commercially important infestations of tulips in the United States by *Ditylenchus dipsaci*, apparently traced to two importations from Holland and England, respectively.

An *Elsinoë* causing an anthracnose of Virginia creeper, A. E. JENKINS and A. A. BITANCOURT. (U. S. D. A. et al.). (*Phytopathology*, 32 (1942), No. 5, pp. 424-427, fig. 1).—*E. parthenocissi* n. sp. is described as causing anthracnose of *Parthenocissus quinquefolia*, the type specimen being from Marlboro, N. H., where the disease was discovered in August 1940 on vines growing as ornamentals. Typical lesions are also reported on herbarium specimens from Apalachicola, Fla., collected in 1891.

Systemic brooming, a virus disease of black locust, T. J. GRANT, D. C. STOUT, and J. C. READEY. (U. S. D. A.). (*Jour. Forestry*, 40 (1942), No. 3, pp. 253-260, figs. 5).—The authors review the history of this disease since 1898 (9 references), its symptoms and behavior (including the distinctions between physiological and virus diseases), field occurrence and seasonal symptoms, and transmission and spread.

Chalaropsis root rot of Chinese elm, E. WRIGHT. (U. S. D. A.). (*Amer. Nurseryman*, 75 (1942), No. 1, pp. 7-9).—*C. thielavioides* has been reported as causing a disease of lupine in Italy, a graft disease of walnut in England, and a graft disease of roses and a serious storage root rot of Chinese elm nursery stock in the United States. In experiments on control of the last named, best results were obtained in northern nurseries by storing the stock inside at low humidity and 35°-38° F. or outdoors in deep heel-in beds of fine, sandy, well-drained soil covered with a straw mulch. In southern nurseries it proved best to leave the stock in place until spring and dig it just before planting time. Precautions against excessive wounding and freezing were prerequisites to successful control by either method. The various chemical dips tried failed to control satisfactorily.

***Scolytus sulcatus* and apple trees in relation to the Dutch-elm disease control program**, S. J. SMUCKER. (U. S. D. A.). (*Phytopathology*, 32 (1942), No. 5, pp. 441-442, fig. 1).—*Ceratostomella ulmi* is said to have spread through inoculated young apple trees but not to have caused external disease symptoms. Evidence is presented that *S. sulcatus*, which breeds in apple and elm wood, is relatively unimportant at present in the Dutch elm disease control program in the United States.

A species of *Poria* causing rot and cankers of hickory and oak, W. A. CAMPBELL and R. W. DAVIDSON. (U. S. D. A. et al.). (*Mycologia*, 34 (1942), No. 1, pp. 17-26, figs. 3).—*P. spiculosa* n. sp. and the injuries caused in hickories and oaks are described.

Venturia acerina*, the perfect stage of *Cladosporium humile, A. G. FLAKIDAS. (Cornell Univ. and La. Expt. Sta.). (*Mycologia*, 34 (1942), No. 1, pp. 27-37, figs. 3).—Culture proof was obtained that the perfect stage of *C. humile*, cause of a leaf spot of red maple (*Acer rubrum*), is a *Venturia*, which is here described as *V. acerina* n. sp.

The spherical gall rust of jack pine, R. POMERLEAU (*Mycologia*, 34 (1942), No. 2, pp. 120-122, fig. 1).—A note on the three types of gall rusts found on *Pinus banksiana* in Quebec, with particular reference to the spherical gall rust, *Cronartium coleosporioides*. Circumstantial evidence is presented that a species of *Melampyrum* may be the secondary host of the last rust. Its range is extended to eastern America, and *P. banksiana* is added to the list of its aecial hosts.

Pests and diseases in rubber-growing, F. BEELEY (*Rubber Res. Inst. Malaya, Planters' Bul.* 17 (1941), pp. 6-10).—A general discussion.

Ptychogaster cubensis, a wood-decaying fungus of southern oaks and waxmyrtle, R. W. DAVIDSON, W. A. CAMPBELL, and G. F. WEBER. U. S. D. A. and Fla. Expt. Sta.). (*Mycologia*, 34 (1942), No. 2, pp. 142-153, figs. 3.).—A fungus tentatively identified as *P. cubensis* was isolated from heartwood decay in *Quercus phellos* from Louisiana and *Q. nigra* and *Q. catesbaei* from Florida, and from decay in numerous living stems of *Myrica cerifera* in Florida. Numerous herbarium specimens of this fungus genus examined from Brazil, Peru, Hawaii, India, Haiti, and the Bahamas seemed referable to *P. cubensis*. Cultures from Florida and Louisiana specimens were studied and are described in detail.

The control of wood decay, M. A. MCKENZIE. (Mass. Expt. Sta.). (*Pests*, 10 (1942), No. 3, pp. 20-21, 32-33).—A general discussion of the causes of wood decay, properties of decayed wood, resistance and susceptibility, control practices, and a bibliography of control information (54 titles).

Host specialization of Anguillulina pratensis (De Man), I, II, C. H. GADD and C. A. LOOS (*Ann. Appl. Biol.*, 28 (1941), No. 4, pp. 372-388).—Two papers are presented:

I. *Attractiveness of roots* (pp. 372-381).—Methods of measuring the attractiveness of seedling roots to *A. pratensis* and *Heterodera marioni* larvae are described. Determinations include a measure not only of the attraction of the root but also of the ability of the worm to enter. Larvae of *A. pratensis* did not enter roots from sand as readily as adults, the difference being attributable to their relative strengths. The attraction of the roots depends to some extent on their rate of growth. Neither nematode species enters recently killed or decaying roots, though they may be attracted to the latter. It is suggested that their entry into living roots is due to the higher concentration of the attractive substance within the growing tissues, whereas the highest concentration in decaying tissues is probably at the surface. *A. pratensis* leaves the roots of some plant species after entry. A measure of the root attractiveness alone fails to offer a reliable criterion of the true susceptibility of the roots.

II. *Behaviour of the parasite within roots* (pp. 382-388).—The behavior of adult female *A. pratensis* within seedling roots of *Crotalaria anagyroides*, *Desmodium gyroides*, turnip, and tea was studied and compared with its behavior in *Tephrosia vogelii*. In tea roots as in *Tephrosia*, the nematodes settle down to a sedentary life; an average of 19 or more eggs are laid in 3 weeks and these hatch normally. In *Desmodium* roots, egg laying proceeds normally during the first week, but later diminishes. An average of 9 eggs only was laid in 3 weeks. Many worms leave the roots after laying eggs. In *Crotalaria* and turnip roots few eggs are laid and many worms leave without laying at all. Few eggs hatch within *Crotalaria* roots or the larvae leave soon after emergence from the eggs. Resistance to attack by *A. pratensis* is not a resistance to entry. True resistance is demonstrated by the departure of worms from invaded roots and an inability of the worms to reproduce at a normal rate.

ECONOMIC ZOOLOGY—ENTOMOLOGY

[Work in economic zoology and entomology by the New Jersey Stations] (*New Jersey Stas. Rpt. 1941*, pp. 39-40, 42-43, 45-46, 46-47, 53-54, 90-93, 106-107, pl. 1).—A series of questions and answers to current problems (E. S. R., 84, p. 786) confronting New Jersey farmers on orchard insect control, ethylene dichloride and paradichlorobenzene crystals for the common peach tree borer, control of fruitworms in blueberries, use of airplanes for application of insecticides and fungicides on cranberry bogs, vegetable insect control, use of parasites for vegetable insects, New Jersey mosquito work, outlook for Japanese beetle control, prevention of termite injury, fowlbrood-resistant strain of bees, radiant energy for insect control, and bulb damage by field mice and moles.

A contribution toward a bibliography on North American fur animals, L. E. YEAGER (*Ill. Nat. Hist. Survey, Biol. Notes No. 16* (1941), pp. IV+209).—A classified bibliography of the literature relating to North American fur animals.

Utilization of rock exposures for den and escape cover by raccoons, L. W. GILES. (Iowa Expt. Sta. et al.). (*Amer. Midland Nat.*, 27 (1942), No. 1, pp. 171-176, figs. 5).

New bird records and some notes for the Virgin Islands, H. A. BEATTY (*Jour. Agr. Univ. Puerto Rico [Univ. Sta.]*, 25 (1941), No. 4, pp. 32-36).—An account is given of observations and collections of 24 avian forms made by the author on St. Croix, St. Thomas, St. John, Tortola, Virgin Gorda, and numerous small outlying islands and cays.

The grebes: Studies of waterfowl in British Columbia, J. A. MUNRO (*Brit. Columbia Prov. Mus., Occas. Papers*, No. 3 (1941), pp. [3]+71, pls. 9).—This contribution on the family Colymbidae or grebes presents a summary of their known distribution and seasonal movements in the province, a contribution to the study of molts and plumages in the case of two species (Holboell's grebe and the eared grebe), and life history observations of interest to the ecologist. Five of the six North American species inhabit British Columbia. A list of 25 references to the literature is included.

Mourning dove production in southwestern Iowa, H. E. McCLOURE. (Iowa Expt. Sta. et al.). (*Auk*, 59 (1942), No. 1, pp. 64-75).

The pileated of Patuxent swamp, B. MEANLEY (*Md. Conserv.*, 18 (1941), No. 4, pp. 9-11, figs. 3).—The habits of the pileated woodpecker as observed in Maryland are described.

Land slugs and snails and their control, W. H. WHITE and A. C. DAVIS (*U. S. Dept. Agr., Farmers' Bul. 1895* (1942), pp. 11+8, figs. 4).—In this account, which supersedes Farmers' Bulletin 959 (E. S. R., 40, p. 55), it is pointed out that land slugs and snails are of economic importance because of their damage to gardens, orchards, greenhouses, and mushroom beds. When they have become established a poisoned bait consisting of 1 oz. of metaldehyde to 3 lb. of wheat bran, slightly moistened, and scattered over the infested area is suggested for control. Another useful bait mentioned is made from 1 part of calcium arsenate and 16 parts of bran. Both baits should be used in the presence of continuously high humidities. If only a few slugs or snails are present, hand picking is recommended.

A report of studies on the control of the garden slug, the symphyllid, and the 12-spotted cucumber beetle, K. W. GRAY, B. G. THOMPSON, and H. E. MORRISON. (Oreg. Expt. Sta.). (*Oreg. State Hort. Soc. Ann. Rpt.*, 33 (1941), pp. 66-68).—A progress report of work which has not progressed sufficiently to warrant definite control recommendations for these pests.

Oysters (*New Jersey Stas. Rpt. 1941, pp. 108-110, pl. 1*).—Brief mention is made of microscopic aquatic plants, chiefly algae (diatoms and dinoflagellates), which form the main source of food for the oyster.

The differentiation of Coenurus species by hook measurements, P. A. CLAPHAM and B. G. PETERS (*Jour. Helminthol., 19 (1941), No. 3-4, pp. 75-84, figs. 2*).

Some mosquito hosts to avian plasmodia, with special reference to Plasmodium gallinaceum, P. F. RUSSELL and BADRI NATH MOHAN (*Jour. Parasitol., 28 (1942), No. 2, pp. 127-129*).

The viability of Trichomonas foetus (Protozoa) in the house fly (Musca domestica), B. B. MORGAN. (Wis. Expt. Sta.). (*Helminthol. Soc. Wash. Proc., 9 (1942), No. 1, pp. 17-20*).—In this study houseflies were fed living *T. foetus*, which were recovered from the digestive tract from 0.5 to 17 hr. after ingestion. Reisolation of *T. foetus* from the intestines of two houseflies indicated that the organisms may still be capable of setting up an infection. It is considered possible that the deposition on the correct biological environment of infectious, regurgitated material (vomit) by houseflies within 1 to 5 min. after feeding may set up an infection. Houseflies were able to pass motile *T. foetus* in their feces for as long as 8 hr. after ingestion.

A simple apparatus for determining the viability of embryonated helminth ova, R. L. BUTLER, JR., and R. O. CHRISTENSON. (Ala. Expt. Sta.). (*Jour. Parasitol., 28 (1942), No. 2, pp. 131-134, figs. 2*).

A useful mixing apparatus for the preparation of suspensions of faeces for helminthological examinations, G. P. KAUSZAL and H. M. GORDON (*Jour. Council Sci. and Indus. Res. [Austral.], 14 (1941), No. 4, pp. 304-305, fig. 1*).

A new apparatus for counting small numbers of nematode eggs in faeces, H. V. WHITLOCK (*Jour. Council Sci. and Indus. Res. [Austral.], 14 (1941), No. 4, pp. 306-307, fig. 1*).

The buoyancy of certain nematode eggs, W. SAWITZ (*Jour. Parasitol., 28 (1942), No. 2, pp. 95-102*).

On the morphology of Mermithonema entomophilum n. g., n. sp., a nematode parasite of the fly Sepsis cynipsea L., T. GOODEY (*Jour. Helminthol., 19 (1941), No. 3-4, pp. 105-114, figs. 6*).

The biology and culture of Neoaplectana chresima, a new nematode parasitic in insects, R. W. GLASER, E. E. MCCOY, and H. B. GIRTH. (U. S. D. A. et al.). (*Jour. Parasitol., 28 (1942), No. 2, pp. 123-126*).—An account is given of the nematode *N. chresima*, found naturally parasitic in two species of insect hosts, and five additional species of insects were found to be susceptible to experimental infection. Certain biological differences between *N. chresima* and *N. glaseri* are noted, and the sterile culture of *N. chresima* is described.

A gazetteer of entomological stations in Ecuador, F. M. BROWN (*Ann. Ent. Soc. Amer., 34 (1941), No. 4, pp. 809-851, figs. 10*).

Additional notes on the behavior of certain insects to different wave-lengths of light, H. B. WEISS, F. A. SORACI, and E. E. MCCOY, JR. (*Jour. N. Y. Ent. Soc., 49 (1941), No. 2, pp. 149-159, figs. 38*).—This further contribution (E. S. R., 85, p. 83) covers the results obtained by testing the color responses of 22 species of insects, including notes supplementing the first tests of 18 species.

The behavior of certain insects to various wave-lengths of light, H. B. WEISS, F. A. SORACI, and E. E. MCCOY, JR. (*Jour. N. Y. Ent. Soc., 50 (1942), No. 1, pp. 1-35, figs. 43*).—This third contribution (see above) includes (1) a report of the results of additional tests in the circular apparatus described in the two previous papers, (2) an account of the behavior of various species in a new sector type of testing box, and (3) the results obtained in an additional piece

of testing equipment which permitted more latitude in the variation of the physical intensities of the wave lengths.

[Contributions on fruit insects and the European corn borer] (*Peninsula Hort. Soc. [Del.] Trans.*, 55 (1941), pp. 23-26, 40-51, 94-96, 98-109, figs. 3).—Among the contributions presented at the annual meeting of the society held at Cambridge, Md., December 10-12, 1941, are Dusting for Control of Strawberry Weevil in 1941, by J. M. Amos and J. H. Beacher (pp. 23-26), Experimental Spraying for Control of Second-Brood Codling Moth, by L. A. Stearns (pp. 40-45), Colonization of the Milky Disease of Japanese Beetle Larvae in Delaware—First Report, by L. A. Stearns, W. W. Fassig, and J. H. Beacher (pp. 46-51), Spraying Requirements for Effective Control of Plum Curculio on Peaches in Southern Delaware, by J. M. Amos (pp. 98-101), and Facts Concerning European Corn Borer of Interest to Delaware Farmers, by D. MacCreary and C. E. Phillips (pp. 102-109) (all Del. Expt. Sta.); and Experiments of the Corn Ear Worm and the European Corn Borer, by E. N. Cory, C. Graham, and L. P. Ditman (pp. 94-96) (Univ. Md.).

[Insect pests control] (*Missouri Sta. Cirs.* 220 (1942), pp. 4, fig. 1; 222, pp. [4], figs. 2; 224, pp. 4, fig. 1; 226, pp. [4], fig. 1; 228, pp. 4, fig. 1; 229, pp. 4, fig. 1).—Practical accounts are presented as follows: Cirs. 220, Bramble and Bush Fruit Insects, by W. W. Smith; 222, Preventing Wormy Apples, by L. Jenkins and L. Haseman; 224, Controlling Fleas, by R. E. Roselle and L. Haseman; 226, Controlling Garden Insects, by L. Haseman; 228, Control of Poultry Lice and Mites, by P. C. Stone; and 229, Combating Stored Grain Pests, by L. Haseman.

[Entomological investigations by the New Mexico Station] (*New Mexico Sta. Rpt.* 1941, pp. 48-61, 80, figs. 2).—A progress report (E. S. R., 85, p. 219) noting work with the codling moth, potato psyllid, and insects affecting field and garden crops (Say stinkbug, *Lygus* spp., cotton flea hopper, *Adelphocoris superbus* (Uhler), cotton leafworm, and the bollworm).

[Entomological investigations by the South Carolina Station]. (Partly coop. Ga. Expt. Sta.). (*South Carolina Sta. Rpt.* 1941, pp. 37-74, 115-121, 123-127, 177-178, figs. 7).—A progress report (E. S. R., 85, p. 84) of work by O. L. Cartwright, F. Sherman, W. M. Upholt, J. G. Watts, F. F. Bondy, C. F. Rainwater, N. Allen, and H. N. Pollard with the oriental fruit moth; tomato fruitworm; cowpea curculio; Comstock's mealybug on apples; studies of bollweevil hibernation, survival, and emergence; control of green June beetle larvae in tobacco plant beds; and pickleworm control.

Entomology (*Tennessee Sta. Rpt.* 1940, pp. 78-81).—A progress report by S. Marcovitch (E. S. R., 85, p. 502) noting advances in plum curculio control, factors influencing the median lethal dose of insecticides for the tobacco hornworm, and control of the rosy apple aphid and the tomato fruitworm, with mention of the cotton louse, elm leaf beetle, and tobacco hornworm as the more important insects of 1940.

[Entomological investigations by the Washington Station]. (Partly coop. U. S. D. A.). (*Washington Sta. Bul.* 410 (1941), pp. 30-31, 34-35, 43-49, 113-114, 118-119, 119-121).—A progress report (E. S. R., 85, p. 503) of work conducted by K. Groves, H. Fallscheer, R. L. Webster, W. J. O'Neill, I. M. Newell, E. C. Carlson, E. P. Breakey, R. D. Eichmann, B. J. Landis, C. W. Getzenander, M. C. Lane, and K. E. Gibson at the station and substations which includes information on factors influencing the selection of oil sprays, the nature and effectiveness of spray coverages, and the efficiency of spray protection on the surface of growing apples; means of increasing the efficiency of sulfur and lime-sulfur sprays applied for orchard mites and scale insects; relative effectiveness of lime-sulfur and oil in combination and separately; the possibilities of replacing lead

arsenate in codling moth control and control of other injurious apple pests by insecticides nonpoisonous to man; control of five species of orchard mites affecting fruit trees in irrigated regions of eastern Washington; pear psylla survey; life history and control of the cherry fruitworm in western Washington; the asparagus beetle as a pest of asparagus in eastern Washington; the asparagus miner in eastern Washington asparagus plantings; thrips as pests of greenhouse carnations; control of the tomato fruitworm in tomatoes grown for canning; biology and control of the potato flea beetles in eastern Washington; wireworm investigations; accessory measures in orchard sanitation; dormant sprays for San Jose scale in cranberry bogs; the cranberry tipworm; and rotenone sprays for the control of the fireworm and the fruitworm.

[**Work in economic zoology and entomology**] (*Philippine Bur. Plant Indus. Ann. Rpt.*, 1938, pp. 101-110, pl. 1).—Work with rice, corn, cotton, citrus, fruit tree, and vegetable or truck crop insects; the migratory locust; termites; poisoning of rats; the biology of the common edible frog (*Rana vittigera*), etc. is reported upon.

A list of food-plants of some Bermuda insects, J. M. WATERSTON (*Hamilton: Bermuda Dept. Agr.*, 1941, pp. [1]+63).

Studies on insects bred from barley, wheat, maize, and oats, F. D. GOODLIFFE (*Bul. Ent. Res.*, 32 (1942), No. 4, pp. 309-325, figs. 2).—Report is made of studies from 1939 to 1941 of the biology of eight species of chloropid flies, four agromyzids, one muscid, and one chrysomelid beetle, whose larvae have been found to live in the tissues of the stems, leaves, or ears of cereal plants largely grown on experimental plats on a farm in northeast Hampshire. Most of these forms attack living tissue, but in the case of at least two of the chloropids the larvae live wholly or partly on the dead remains for which some of the other species are responsible.

A report of some investigations on the corn insects of Puerto Rico. B. A. APP. (U. S. D. A.). (*Jour. Agr. Univ. Puerto Rico [Univ. Sta.]*, 25 (1941), No. 4, pp. 21-31).—The corn leafhopper *Percgrinus maidis* Ashm., the otiid fly *Euxesta stigmatias*, the fall armyworm, and the corn earworm were found important as corn pests in Puerto Rico during the period from August 1935 to June 1936. Lead arsenate dusts gave as high as 88.2 percent control of fall armyworms. Barium fluosilicate proved less satisfactory. Dusting at weekly rather than 10-day intervals appeared to improve control. Although no insecticide gave encouraging results for corn earworm control, barium fluosilicate proved most satisfactory of any chemical tested, but burned plants severely. Application of hog rings, paper caps, strings, and wires to ear tips all gave substantial control, and these methods appeared to warrant further trial.

[**Sugar beet insects**] (*Amer. Soc. Sugar Beet Technol. Proc.*, [2] (1940), pt. 2, pp. 241-251).—Contributions presented at the general meeting of this society held at Denver, Colo., January 3-6, 1940, are Aphids Affecting Sugar Beets, by M. A. Palmer (pp. 241-244); Life History and Control of the Major Leaf Eating Insect Pests of the Sugar Beet, Excluding Grasshoppers, by C. R. Jones (pp. 244-249); and Hemipterous Insects Affecting Sugar Beets Grown for Seed, by O. A. Hills and V. E. Romney (pp. 250-251) (U. S. D. A.).

Insect pests of cigar-type tobaccos in the southern districts, F. S. CHAMBERLIN and A. H. MADDEN (*U. S. Dept. Agr. Cir.* 639 (1942), pp. 54, figs. 57).—Pertinent facts concerning the habits and control of insect pests attacking cigar-type tobaccos in the southern districts of the United States are summarized. The injurious insects which occur most frequently in tobacco plant beds are the southern mole cricket, changa, tobacco flea beetle, potato flea beetle, and cutworms. The three major pests in the field are the tobacco budworm, tobacco

hornworm, and the tobacco flea beetle. The tobacco budworm may be controlled by a poisoned bait consisting of corn meal and lead arsenate (75:1), the tobacco hornworm by maintaining the cloth tops of the shade fields in sound condition, and flea beetles by dusting with cube- or derris-root powder containing 1 percent of rotenone. Complete destruction of all stalks as soon as the crop is harvested is a helpful practice in flea beetle control. Poisoned-bran bait is used for the control of cutworms and grasshoppers.

[Contributions on fruit tree insects and their control] (*Wash. State Hort. Assoc. Proc.*, 37 (1941), pp. 37-40, 93-141, figs. 2).--Contributions on fruit insects presented at Wenatchee in December 1941 are: Developments in the Pear Psylla Control Program in the Pacific Northwest During 1941, by J. F. Cooper (pp. 37-40), Further Results With Scraping and Banding as a Supplementary Codling Moth Control Measure (pp. 93-95) and Miscellaneous Findings Relating to Scraping and Banding in Codling Moth Control Studies (pp. 96-97), both by M. A. Yothers and F. W. Carlson, and The Control of Insects on Pear Trees in Central Washington, by E. J. Newcomer (pp. 103-104) (all U. S. D. A.); Ovicidal Value of Light Mineral Oils for Codling Moth Control, by R. L. Webster and E. C. Carlson (pp. 107-110), Apple Thinnings as a Source of Codling Moth Infestation, by G. P. Sisler and W. J. O'Neill (pp. 113-116), Experiments and Trends in Spray Residue Removal, by H. Fallscheer and F. L. Overley (pp. 119-126), and A Clean Up Codling Moth Experiment, by W. J. O'Neill and H. Fallscheer (pp. 139-141) (all Wash. Expt. Sta.); and Why Was Codling Moth Easier to Control in 1941 Than in 1940 and What Will It Be in 1942? by R. E. Smith (p. 118).

Forest entomology (*Quebec Dept. Lands and Forests, Fish and Game, Contrib. 12* (1941), pp. 5-11).--This report deals particularly with the results of a forest insect survey, by R. Lambert (pp. 5-7); the European spruce sawfly, its distribution, by M. E. Genest, population studies, by R. Martineau, and its development in relation to climate, by G. Paquet (pp. 7-9); and parasites (pp. 9-11).

[Contributions on parasites of teak insects] (*Indian Forest Rec., n. ser., Ent.*, 5 (1939), No. 4-6, pp. [1]+309-395, pl. 1, figs. 7).--Contributions presented are: On the Biology of the Parasites of the Teak Defoliators *Hapalia machaeralis* Walk. (Pyralidae) and *Hyblaea pueria* Cram. (Hyblaeidae) in Burma, by P. F. Garthwaite and M. H. Desai (pp. [1]+309-353); Further Notes on the Biology of Parasites of Teak Defoliators in India, by C. F. C. Beeson and S. N. Chatterjee (pp. 355-379); and On the Biology and Morphology of *Apanteles machaeralis* Wlkn. (Braconidae: Hymenopt.), by P. N. Chatterjee (pp. 381-395).

Insects and epidemiology of poliomyelitis, A. B. SABIN and R. WARD (*Science*, 95 (1942), No. 2464, pp. 300-301).

Insecticides (In *Proceedings of the Eighteenth Annual Cumberland-Shenandoah Fruit Workers' Conference, Winchester, Va., Nov. 21-22, 1941*. [Winchester, Va., 1941], pp. 3-5).--This part of the report of the committee on insects and diseases for the year 1941 (*E. S. R.*, 85, p. 86), relates particularly to their use in the control of the codling moth, red mite, terrapin scale, scurfy scale, pistol casebearer, and curculio.

Insecticidal value of certain dusts for the protection of stored grain, R. T. COTTON, G. B. WAGNER, and T. F. WINBURN. (U. S. D. A.). (*Jour. Kans. Ent. Soc.*, 15 (1942), No. 1, pp. 1-6).--It is considered improbable that adequate protection from insects can be obtained for stored grain by admixture with dusts other than those which are poisonous or which exert some deleterious effect on the grain.

Spray damage and apple capsid control by winter petroleum, W. STEER and M. H. MOORE (*East Malling [Kent] Res. Sta. Ann. Rpt.*, 28 (1940), pp.

76-81).—Field spraying tests were made with winter petroleum oil to determine the influence of period of spraying on spray damage and on the degree of control of the apple capsid *Plesiocoris rugicollis*. "On plums the rate of application, i. e., once-sprayed or twice-sprayed, was more important as a factor in spray damage than the period at which the spray was applied. On apples the results were similar but less pronounced. Though there are many contributory factors, an unduly heavy oil deposit, which readily accrues from spraying in windy weather, can itself cause severe bud injury. Late spraying is imprudent because of the uncertainty of the weather and of the risk of scorching the opening blossom trusses if delays occur, although, as the data show, late spraying is more effective against capsid. Earlier spraying should prove effective provided at least 6 percent of oil is used, and it gives more opportunities of choosing calm weather."

Dinitrocresol and other dual purpose winter washes, H. SHAW and W. STEER (*East Malling [Kent] Res. Sta. Ann. Rpt.*, 28 (1940), pp. 72-75).—It was found in field and laboratory tests that 3:5-dinitro-o-cresol (D. N. C.) can be relied upon to control the eggs of the plum aphid *Anuraphis padi*, the hop aphid, apple aphid, and the apple sucker when used at a concentration of 0.05 percent in a grade E type of petroleum oil. β -butoxy- β' -thiocyanodiethyl ether (as Lethane 410) and lauryl thiocyanate were each less toxic to the eggs of any of the pests against which they were tested, although the first of these is at 0.1 percent a satisfactory constituent of a dual purpose wash. None of them was sufficiently toxic to winter moth (*Operophtera brumata*) eggs to contribute much to the control of caterpillar given by a winter petroleum wash. At 0.1 percent dinitrocresol was more toxic than Lethane 410 to red spider (*Oligonychus ulmi*) eggs, but the amount of oil likely to be used with such a concentration is itself sufficiently toxic. D. N. C. washes are favored for use late in the dormant season or at early bud burst (up to mid-March), but suitable thiocyanate washes may be useful in special circumstances as, for instance, where spraying is necessarily done very late or where market garden crops are interplanted. The use of a D. N. C. wash is shown to be the cheapest method of controlling aphids, apple sucker, winter moth, red spider, and capsid bugs by winter spraying.

The disinfecting value of pine oil emulsions, G. F. REDDISH (*Soap and Sanit. Chem.*, 17 (1941), No. 9, pp. 88-90).

Methyl bromide fumigation, P. O. RITCHER. (Ky. Expt. Sta.). (*South. Florist and Nurseryman*, 52 (1942), No. 24, pp. 7-8).—The value of methyl bromide, particularly in the fumigation of nursery stock, including the crown borer on strawberries, is considered.

Commercial insecticidal sulfurs: Average particle diameters as determined by air permeation, E. L. GOODEN. (U. S. D. A.). (*Indus. and Engin. Chem.*, 33 (1941), No. 11, pp. 1452-1453, fig. 1).—In a survey made of commercial insecticidal powdered sulfurs with regard to average diameters (surface mean diameters) by means of the self-calculating air-permeation apparatus, the average diameters in the 54 samples tested were found to range from 5μ to 25μ . The plain sulfurs occupy mainly the upper half of the range and the wettable and conditioned sulfurs the lower half.

In place of sugar in tartar emetic sprays, A. M. BOYCE and C. O. PERSING. (Calif. Citrus Expt. Sta.). (*Citrus Leaves*, 22 (1942), No. 3, p. 15).—Preliminary tests indicate either sorghum sirup or honey to be the most promising substitute for sucrose in tartar emetic sprays. Glucose or dextrose, corn sugar, and molasses do not appear to offer as much promise. It is suggested that sorghum sirup or honey, 1.5 pt. per pound of tartar emetic, may be used.

Toxicity of rotenone, R. C. ROARK. (U. S. D. A.). (*Soap and Sanit. Chem.*, 17 (1941), No. 9, p. 93).

Adaptation of the color reaction for rotenone, dihydrorotenone, and deguelin to the photo-electric colorimeter, H. D. ANDERSON and A. L. MOXON. (S. Dak. Expt. Sta.). (*S. Dak. Acad. Sci. Proc.*, 21 (1941), pp. 60-64).

Field experiments in baiting fliers of the brown locust, with notes on physical ecology, W. J. DE WET (*Union So. Africa Dept. Agr. and Forestry, Sci. Bul.* 31 (1941), pp. 44).—Experiments with poison bait against adults of *Locustana pardalina* (Walk.) during autumn and winter are reported. The results indicated that baiting sexually immature fliers was not successful. On the other hand, baiting of ovipositing fliers gave satisfactory results during autumn and winter and may be advocated as an additional measure of controlling *L. pardalina*. At the same time more economical carriers were tested. Preliminary notes taken on locust behavior as influenced by weather conditions are also discussed in the paper.

Effect of blocking hemocytes with Chinese ink and staining nephrocytes with trypan blue upon the resistance of the [American] cockroach (*Periplaneta americana* (L.)) to sodium arsenite and nicotine, J. F. YEAGER, E. R. MCGOVAN, S. C. MUNSON, and E. L. MAYER. (U. S. D. A.). (*Ann. Ent. Soc. Amer.*, 35 (1942), No. 1, pp. 23-40, figs. 7).

A simple method of controlling termites, J. C. CROSS (*Science*, 95 (1942), No. 2469, p. 433).—It is claimed that discarded lubricating oil placed at time of construction in small ditches about supporting concrete piers which form the foundation has protected buildings against the entrance of termites in locations where the soil is badly infested.

Notes on the predaceous thrips *Haplothrips subtilissimus* Hal. and *Acolothrips melaleucus* Hal., W. L. PUTMAN (*Canad. Ent.*, 74 (1942), No. 3, pp. 37-43, fig. 1).—These notes relate particularly to *H. subtilissimus*, which was found generally distributed but seldom abundant in peach orchards in the Niagara Peninsula of Ontario, occurring in greatest numbers on trees infested with the European red mite. Eggs of this mite and the common red spider were attacked as well as those of the oriental fruit moth and other insects. Data on various phases of the life history were obtained. There were four generations per year, only one or two of which were complete, and the adults hibernated. Reproduction was thelytokous, males not being found during the study. The species was of minor importance as a predator.

Brief notes are also given on *A. melaleucus*, occasionally found attacking mites in peach orchards.

Pediculosis—A new treatment, L. P. MACHAFFIE (*Canad. Pub. Health Jour.*, 32 (1941), No. 12, pp. 606-607).—A single treatment with a 15-percent solution of lethane (*n*-butylcarbitol thiocyanate) in purified kerosene, by hand or with a fine fly spray, the roots of the hair being well soaked, has been found by C. R. Twinn to be highly effective and inexpensive in the eradication of the head louse. It is suggested that a much weaker preparation might be effective, and that the replacement of part of the kerosene with olive oil would lessen any irritation that might occur.

The sycamore plant bug, C. C. HAMILTON. (N. J. Expt. Stas.). (*Arborist's News*, 6 (1941), No. 11, pp. 81-82, figs. 2).—Control of *Plagiognathus albatus* Van Duzee, which attacks the fully grown leaves in the spring, may be obtained by spraying with 40 percent nicotine sulfate, diluted 1 part to 600 parts of water plus sufficient soap to make 0.25 percent actual soap in the diluted spray. Other wetting agents are also satisfactory. The first spray should be applied between the first and the middle of May. A second spray about 10 days later may be necessary. Particular care should be taken to wet the lower surfaces of the leaves.

Geocoris atricolor feeding, G. F. KNOWLTON and G. S. STAINS. (Utah. Expt. Sta.). (*Bul. Brooklyn Ent. Soc.*, 36 (1941), No. 5, pp. 201-202).—Microscope observations of the feeding of the predatory black-eyed bug *G. atricolor* on pea aphids near Logan, Utah, are reported.

The beet leafhopper, W. C. COOK (*U. S. Dept. Agr., Farmers' Bul.* 1886 (1941), pp. II+21, figs. 11).—A practical digest of present knowledge of the life history, bionomics, and control of the insect vector of the virus of curly top disease of the sugar beet, a serious pest of several vegetable crops and ornamental plants in the Western States. Particular attention is given to its breeding grounds, host plants, and migrations in the sugar beet-growing areas. It is pointed out that planting varieties of sugar beets resistant to the disease has greatly reduced the damage and extended the cultivation of the crop into areas formerly regarded as unsuitable. In many areas the control of grazing has been found the most feasible method of attacking its host plants, but in some sections the reduction or elimination by mechanical means of Russian-thistle, the most important summer host of the beet leafhopper, is possible. Damage to beets, and possibly to some other crops, may be reduced by timing the planting date with reference to leafhopper migrations.

The pine spittle bug (*Aphrophora parallela* Say), C. F. SPFERS (*N. Y. State Col. Forestry, Syracuse Univ., Bul.*, 14 (1941), No. 2-a, pp. 65, figs. 25).—A study is reported of the pine spittle bug, a native species of the United States widely distributed throughout the eastern coniferous region and ranges as far west as Saskatchewan, Canada, and the most serious pest attacking Scotch pine (*Pinus sylvestris*). Its injury appears first on the branch tips at the base of the crown and then, as attack continues, it progresses upward through the crown, killing the larger branches. If attack continues the death of the tree occurs within 2 or 3 yr. after the first signs of damage appear. The pine spittle bug spends the winter in the egg stage, in either dead twigs or in the outer layers of the bark on small twigs. Nymphs hatch from these eggs in May at the time when the buds begin to swell. These nymphs, after passing through five instars, transform to adults during the latter part of July and first part of August. Oviposition by these adults starts about a week after their transformation and continues until the second week in September. It is able to feed on many coniferous tree species in northeastern United States. The new hosts for this insect are European larch, Japanese red pine, hemlock, lodgepole pine, western yellow pine, limber pine, Japanese black pine, and Austrian pine. Planting of other coniferous species in mixture with Scotch pine is not a control, as the Scotch pine, in this case, is as susceptible to injury as when planted in pure stands. Control of the pine spittle bug on ornamental trees may be obtained by spraying with the pyrethrum extract "Evergreen" at the rate of 1:400. The best time for application of this spray is during the early part of June. This type of control may also be economically applied to small isolated forested areas where there is little danger of reinfestation. Silvicultural control is the only practical method for this insect under forestry conditions, and is best applied by making thinnings at the proper time to encourage vigor and increased growth. Cleaning up the stand by the removal of dead and dying branches, dying trees, and similar sanitary practices keeps down the population of the pine spittle bug, since many of them oviposit in such material.

The effect of temperature and wind on pea aphid control with rotenone-bearing dusts, R. L. JAMES [JANES] and H. F. WILSON. (Univ. Wis.). (*Canner*, 94 (1942), No. 11, pp. 10-11).—Report is made of dusting experiments conducted on central Wisconsin pea fields June 3-4, 1941, with the view to determining the importance of temperature and wind. The findings have led to the conclusion that under the conditions of the experiment and with the machine used, good

commercial control is possible with dusts containing as little as 0.5 percent rotenone when the temperature is as low as 60° F., and that with the same machine and a properly weighted apron satisfactory control can be secured at wind velocities up to 15 m. p. h. Pending additional findings, it is recommended, however, that dusting be suspended when the velocity of the wind is in excess of 10 m. p. h.

A survey of the aphid population of potato crops in Ireland in relation to the production of seed potatoes, J. B. LOUGHNANE ([*Irish Free State*] *Dept. Agr. Jour.*, 37 (1940), No. 2, pp. 370-382, figs. 2).—In a survey of the aphid population of potato crops in Ireland, carried out in 1938-39, the green peach aphid was present in negligible numbers at most centers. It is concluded that conditions affecting the number of green peach aphids in the seed-growing areas of the west of Ireland are not such as to promote larger populations of this pest.

Work at East Malling on the control of the strawberry aphid, A. M. MASSEE and R. M. GREENSLADE (*East Malling [Kent] Res. Sta. Ann. Rpt.*, 28 (1940), pp. 92-94, figs. 2).—The successful control of *Capitophorus fragariae*, vector of strawberry virus diseases, by the use of vaporized nicotine is reported upon.

The use of dusting machines in controlling pea aphids, H. F. WILSON and R. L. JANES. (Univ. Wis.). (*Canner*, 94 (1942), No. 16, pp. 24, 26, 28, figs. 4).

The life history and habits of the ring-legged earwig (*Euborellia annulipes* (Lucas)) (order Dermaptera), E. C. KLOSTERMEYER (*Jour. Kans. Ent. Soc.*, 15 (1942), No. 1, pp. 13-18).

Feeding of the Mexican bean beetle larva, N. F. HOWARD. (U. S. D. A.). (*Ann. Ent. Soc. Amer.*, 34 (1941), No. 4, pp. 766-769, pl. 1).—A brief description of the feeding of the Mexican bean beetle in a manner somewhat similar to that of thrips, which rasp and suck.

A mathematical theory of the growth of population of the [confused] flour beetle (*Tribolium confusum* Duv.), IV, V, J. STANLEY (*Ecology*, 22 (1941), No. 1, pp. 23-37, figs. 5; 23 (1942), No. 1, pp. 24-31, fig. 1).—In continuation of this series of studies (E. S. R., 72, p. 817) part 4 presents a modified theory descriptive of the relation between the limiting value of egg populations in the absence of hatching and the volume (or weight) of flour used in the culture; part 5 considers the relation between the limiting value of egg populations in the absence of hatching and the sex ratio of the group of adult beetles used in a culture.

Flour and the growth of *Tribolium*, E. BARTON-WRIGHT (*Nature [London]*, 148 (1941), No. 3758, pp. 565-566).—In experiments conducted with a view to supplementing existing knowledge as to members of the vitamin B complex required for the pupation of *Tribolium* it was found that neither riboflavin nor nicotinic acid, either alone or in conjunction with aneurin, will bring about pupation. On the other hand, pupation will take place in the presence of aneurin plus a factor present in liver or yeast eluate. It is pointed out that although pupation does not take place in the presence of vitamin B₆ alone, the larvae remain alive and healthy for as long as 70 days and increase considerably in size, whereas in the riboflavin or nicotinic acid mixtures they die off in about 30 days. It is considered evident from these experiments that while aneurin and vitamin B₆ are essential for pupation, there must also be present, even in patent flour, some other growth factor which is as important as any of the known members of the vitamin B complex in promoting rapid growth and pupation.

Anobium magnum (Coleoptera: Anobiidae): A new borer, L. J. DUMBLETON (*New Zeal. Jour. Sci. and Technol.*, 22 (1941), No. 6B, pp. 294B-299B, figs.

6).—A large anobiid beetle which occasionally causes severe damage to structural timber in New Zealand is described as new under the name *A. magnum*.

The relationship between nitrogen metabolism and the duration of the larval stage of the death-watch beetle *Xestobium rufovillosum* De G. reared in wood decayed by fungi, W. G. CAMPBELL (*Biochem. Jour.*, 35 (1941), No. 10-11, pp. 1200-1208, figs. 3).

The Coleoptera of Washington: Scolytoidea, G. K. PATTERSON (*Wash. Univ. [Seattle] Pubs., Theses Ser.*, 6 (1942), pp. 113-114).—Eighty-eight species of bark beetles representing 31 genera are listed, in this abstract of a thesis, as occurring in the State of Washington.

The biology and distribution of the parasites of the cotton stem weevil *Pemphres affinis* Fst. in South India, P. N. KRISHNA AYYAR (*Indian Acad. Sci. Proc.*, 14 (1941), No. 5, Sect. B, pp. 437-453, pls. 5).—The percentage of parasitism in cotton fields appears to be too low to exercise any adequate control of *P. affinis*, which has long been accounted as one of the major pests of cotton grown in South India. The host-parasitic ratio is capable of being improved by artificial multiplication and timely liberation of at least one species, *Spathius critolaus*. Beneficial results may follow this procedure.

The British brown and green leaf weevils associated with cultivated fruit trees and bushes, A. M. MASSEE (*Jour. Pomol. and Hort. Sci.*, 19 (1941), No. 1-2, pp. 78-81).—A brief account is given of five species of leaf-eating weevils of the genus *Phyllobius* that are associated with cultivated fruit trees in Great Britain, namely, *P. oblongus* L., *P. pyri* L., *P. calceatus* F., *P. argentatus* L., and *P. maculicornis* Gm. *P. pomonae* Ol., found on oak, and *Polodrosus cervinus* L., which very occasionally feeds on wild crab apple leaves, are also briefly mentioned. A key for the identification of the species that attack fruit tree leaves is included.

New Coleoptera from Puerto Rico, W. S. FISHER. (U. S. D. A.). (*Jour. Agr. Univ. Puerto Rico [Univ. Sta.]*, 25 (1941), No. 4, pp. 37-39).—The anobiid beetle *Catorama neltumae*, reared from the seed pods of mesquite (*Neltuma juliflora*) from Guanica, P. R., and the cerambycid beetle *Trypanidius nocturnus* from Villalba, P. R., are described as new to science.

New descriptions of larvae of forest insects.—Introduction; I, *Panthea* (Lepidoptera: Phalaenidae). II, *Anomogyna* (Lepidoptera: Phalaenidae). III, *Zanclognatha*, *Palthis*, and *Autographa* (Lepidoptera: Phalaenidae), A. W. A. BROWN and W. C. MCGUFFIN (*Canad. Ent.*, 74 (1942), Nos. 1, pp. 8-12, figs. 2; 2, pp. 21-25, pls. 2, figs. 4; 3, pp. 52-56, pl. 1, figs. 4).—In the first of this series of descriptions, *Panthea acronyctoides* Wlk. is dealt with.

Part 2 presents descriptions of the larvae of *Anomogyna climata* Gn., which feed on white, black, and Engelmann spruce and are also found on balsam fir, hemlock, and red and jack pine, and of *A. perquiritata* Morr., which feed on white and black spruce and also on balsam fir.

Part 3 describes the larvae of *Z. minoralis* Sm., which feed on the foliage of black and white spruce; of *Palthis angulalis* Hbn., which feed on white, black, Engelmann, and Sitka spruce and also on balsam fir, with records also of white and gray birch, sugar maple, and choke cherry as host trees; and of *Autographa selecta* Wlk., *A. alias* Ottol., and *A. rectangula* Kby., all three of which feed on white and black spruce, *A. rectangula* feeding on balsam fir in addition and *A. selecta* on Engelmann spruce, balsam and Douglas fir, and white and lodgepole pine.

Timing the cover sprays for codling moth, E. H. GLASS, J. J. MCKELVEY, and H. V. COUPER. (Va. Expt Sta.). (*Va. Fruit*, 30 (1942), No. 2 pp. 17-18, fig. 1).

Preliminary notes on the parasites of the spotted and the pink bollworms of cotton in Coimbatore, M. C. CHERIAN and M. S. KYLASAM (*Indian Acad. Sci. Proc.*, 14 (1941), No. 6, Sect. B, pp. 517-528).

False yellowhead fireworm, C. S. BECKWITH. (N. J. Expt. Stas.). (*Amer. Cranberry Growers' Assoc., Proc. Ann. Mtg.*, 72 (1942), pp. 23-25).—Spraying with arsenate of lead (4 lb. to 100 gal.) and nicotine sulfate (1-500) added to the regular bordeaux mixture gave sufficient control of *Sparganothis sulfureana* Clem. to prevent browning of foliage, but not enough to prevent a damaging second generation. Repeated applications of arsenate of lead year after year appear to make bogs more susceptible to *S. sulfureana* attack than bogs that do not have this treatment. General observations indicated that the spraying reduced the parasites so much that the second generation of worms was much greater than it would have been normally. In this work the bogs were drawn early, and therefore the spraying was put on under a handicap. If the water had been held until May 10 in order to concentrate the appearance of the worms and an adequate spraying were correctly timed, good control could have been obtained. On smaller bogs control could have been obtained even with early drawing, but with large uneven bogs the job was too large for the number of men at hand.

X-ray studies of starving mealworm larvae, G. F. MACLEOD. (Univ. Calif.). (*Ann. Ent. Soc. Amer.*, 34 (1941), No. 4, pp. 696-701, pls. 2).

Nutrition of the wax moth larvae: Vitamin requirement.—I, Requirement for vitamin B, M. H. HAYDAK. (Minn. Expt. Sta.). (*Minn. Acad. Sci. Proc.*, 9 (1941), pp. 27-29).—Wax moths have been reared from eggs to the adult stage on a synthetic diet here described. When autoclaved yeast was substituted for untreated dry yeast the larvae failed to grow and all died. When such diet was supplemented with thiamin chloride the development was normal.

The filbert worm problem, G. B. THOMPSON. (Oreg. Expt. Sta.). (*Oreg. State Hort. Soc. Ann. Rpt.*, 33 (1941), pp. 127-128).—A brief account of the filbert worm, which was extremely serious in some Oregon filbert orchards during the season of 1941. Its seasonal history differed from that of previous years in that eggs were deposited on the filberts over a much longer period. Despite the heavy infestation and extended egg deposition, good control was obtained in most of the experimental tests. The importance of destruction of worms that emerge from the nuts during the drying process and would escape to again infest the orchard is emphasized. A spray consisting of 3 lb. of lead arsenate to 100 gal. of water, to which is added a small amount of spreader, is recommended.

In a discussion which follows this contribution [S. M.] Dohanian, of the U. S. Department of Agriculture, refers (1) to the observation on Santa Catalina Island, Calif., that the same species and variety of this pest which breeds in the filbert kernel also attacks the Catalina cherry and (2) to experiments conducted at the Federal laboratory at Eugene, Oreg., which indicated strongly that oak acorns were the original source of infestations occurring in filbert groves.

Nomophila noctuella as a grass and alfalfa pest in Kansas (Lepidoptera: Pyralidae), R. C. SMITH. (Kans. Expt. Sta.). (*Jour. Kans. Ent. Soc.*, 15 (1942), No. 1, pp. 25-34, figs. 4).—Observations of the life history and habits of *N. noctuella* D. & S. (commonly referred to as the celery stalk worm), the larvae of which feed to some extent on alfalfa, are reported.

New fly parasites of Diatraea in São Paulo, C. H. T. TOWNSEND (*Rev. Ent.*, 12 (1941), No. 1-2, pp. 339-341).—Description is given of *Parthenoleskia parkeri* n. gen. and sp., reared by H. L. Parker, of the U. S. Department of Agriculture,

at São Paulo, and *Palpozenillia diatraeae* n. sp. from Itaquaquecetuba, both from the sugarcane borer in corn.

Over biologie en bestrijding van den randoc-kolfboorder *Mudaria variabilis* Rpke. (Lep., Noctuidae) (Life history and control of the randu-podborer *Mudaria variabilis* Rpke. (Lepidoptera: Noctuidae)), C. J. H. FRANSSEN, P. LEVERT, and J. A. VAN DUYNENDIJK ([*Dutch East Indies*], *Dept. Econ. Zakcn. Meded. Alg. Proefsta. Landb.*, No. 51 (1941), pp. 70, pls. 2; *Eng. abs.*, pp. 63-65).—Report is made of control work with *M. variabilis*, a major pest of the randu tree (*Ceiba pentandra*) in Java. The core and the seeds inside the pods are damaged and the fibers contaminated by the caterpillars within the pod.

Codling moth control programs for western New York, 1942, S. W. HARMAN (*New York State Sta. Cir.* 140, rev. (1942), pp. 12, fig. 1).—This is a revision (E. S. R., 71, p. 512).

On water-finding and oviposition by captive mosquitoes, J. S. KENNEDY (*Bul. Ent. Res.*, 32 (1942), No. 4, pp. 279-301, figs. 4).

On the ecology of larvae of *Anopheles culicifacies* Giles in borrow-pits, P. F. RUSSELL and T. RAMACHANDRA RAO (*Bul. Ent. Res.*, 32 (1942), No. 4, pp. 341-361, pl. 1, figs. 6).

The black currant leaf midge *Dasynceura tetensi* (Rübs.), R. M. GREENSLADE (*East Malling [Kent] Res. Sta. Ann. Rpt.*, 28 (1940), pp. 66-71, figs. 3).—*D. tetensi* is becoming more common in Kent and is of importance as a pest in the nursery. In 1940 four generations were observed, the adult flies being on the wing in May, June, July, and August. It is probable that some of the flies of the last generation do not emerge until the following spring. The insect is confined to *Ribes nigrum*, but there are considerable differences in susceptibility between different varieties, the variety Goliath being particularly susceptible. The adult flies appear to be much influenced by wind, since the sheltered parts of currant plantations are more heavily infested than those exposed to wind. Attempted control measures are described, and methods for future trial, based on the knowledge acquired of the life history, are discussed.

Notes on three western genera of flies (Diptera: Tabanidae), C. B. PHILIP (*Bul. Brooklyn Ent. Soc.*, 36 (1941), No. 5, pp. 185-199).—These notes relate to species of Tabanidae of the genera *Silvius*, *Apatolestes*, and *Brennanina* n. n., all of which are known to occur west of the Mississippi River.

Algunas observaciones sobre las moscas de las frutas en la Argentina [Observations of fruitflies in Argentina], K. J. HAYWARD (*Rev. Indus. y Agr. Tucumán*, 31 (1941), No. 7-9, pp. 324-330, figs. 2).

Common insect pests of New York.—4, The apple maggot, P. J. PARROTT and P. J. CHAPMAN (*New York State Sta. Cir.* 161, rev. (1942), pp. [4], fig. 1).—This is a revision (E. S. R., 74, p. 228).

On the formation of the tracheal funnel in *Anasa tristis* DeG. induced by the parasite *Trichopoda pennipes* Fabr., R. L. BEARD. (Conn. [New Haven] Expt. Sta.). (*Ann. Ent. Soc. Amer.*, 35 (1942), No. 1, pp. 68-72, figs. 2).

Monograph of the South American mutillid genus *Hoplocrates* Mickel (Hymenoptera: Mutillidae), C. E. MICKEL. (Minn. Expt. Sta.). (*Rev. Ent.*, 12 (1941), No. 1-2, pp. 341-414).—This monograph, in which 24 species of the genus *Hoplocrates* from South America and 3 varieties are described as new, includes a geographical catalog of species and references to the literature cited.

Descriptions of five new species of Chalcidoidea, with notes on a few described species (Hymenoptera), A. B. GAHAN (*U. S. Natl. Mus. Proc.*, 92 (1942), No. 3137, pp. 41-51).—Three species of *Brachymeria* (one each from Panama, Mexico, and Java), one of *Blepyrus* from Louisiana, and *Ooencyrtus*

anabrivorus, which species is parasitic in eggs of the Mormon cricket in Wyoming, are described as new.

The bethylid parasite (*Perisierola nephantidis* M.) of the coconut caterpillar *Nephantis serinopa* Meyr., T. J. JAYARATNAM (*Trop. Agr. [Ceylon]*, 97 (1941), No. 3, pp. 115-125, pl. 1).—Report is made of the life history, distribution, and economic importance of *P. nephantidis*, a bethylid wasp parasite of the coconut caterpillar.

A new ant parasite (Hymenoptera: Braconidae), C. F. W. MUESEBECK. (U. S. D. A.). (*Bul. Brooklyn Ent. Soc.*, 36 (1941), No. 5, pp. 200-201).—A braconid of the genus *Elasmosoma* Ruthe from Jackson, Ohio, a parasite of *Formica sanguinea rubicunda* Emery, is described as new under the name *E. petulans*.

The citrus bud mite [*Eriophyes sheldoni* Ewing] and its control, A. M. BOYCE, R. B. KORSMEIER, and C. O. PERSING. (Calif. Citrus Expt. Sta.). (*Calif. Citrog.*, 27 (1942), No. 5, pp. 124-125, 134, 136-138, 140-141, figs. 12).—This work has been noted from another source (*E. S. R.*, 86, p. 681).

Note on the association of the tick *Ornithodoros talaje* (Guérin-Meneville) with bat infestations in human dwellings in Brazil, J. CANDIDO M. CARVALHO. (Univ. Nebr. et al.). (*Jour. Parasitol.*, 28 (1942), No. 2, p. 165).

Notes on Minnesota ticks, W. A. RILEY. (Minn. Expt. Sta.). (*Minn. Acad. Sci. Proc.*, 9 (1941), pp. 57-61, figs. 5).

ANIMAL PRODUCTION

[Feeding experiments with poultry and beef by the New Jersey Stations] (*New Jersey Stas. Rpt.* 1941, pp. 28, 29, 30-31, 34, 71-72).—Brief results are reported of experiments on the best hatching season for egg production; excellent growth of chicks with skim milk powder but no green feed; lawn clipping silage for growing chicks; relation of lecithin to absorption of carotene and vitamin A by chickens; relation of rate of growth to sexual maturity in pullets; management of laying hens and progeny testing in individual cages; influence of egg quality preservation devices on the average New Jersey poultry plant; efficiency of pigeons for the utilization of feed in squab production; value of winter barley for swine; silage from lawn clippings for dairy goat production; and meat scrap or fresh beef in relation to the hemoglobin content of white rats.

[Livestock investigations by the New Mexico Station] (*New Mexico Sta. Rpt.* 1941, pp. 43-47, 85-86).—Results are briefly reported on an improved method of determining the carrying capacity of ranges; lamb and wool production of smooth and wrinkled Rambouillets mated together and with Corriedales, Romneys, and Hampshires; first and third cuttings of alfalfa hay with cottonseed hulls for fattening cattle; grazing Pingue with sheep; different cuttings and baled alfalfa hay for sheep; replacement of dried buttermilk by soybean meal for battery laying hens; and selection of strains of hens for high and low egg albumen quality.

[Livestock production and grazing studies by the South Carolina Station] (*South Carolina Sta. Rpt.* 1941, pp. 78-81, 90-92, 93-98).—Results are briefly reported by L. V. Starkey, E. G. Godbey, G. W. Anderson, C. L. Morgan, J. H. Mitchell, R. C. Ringrose, E. J. Lease, E. D. Kyzer, J. H. Mitchell, and R. L. Jones on the relative mortality of crossbred and purebred pigs; factors affecting the economy of gains made by fattening pigs; effect of ration on rate and cost of gains and quality of beef produced; the negative calcium balances of hens after laying; comparison of alfalfa and lespedeza feeds as sources of carotene, and its utilization by chicks; utilization by beef cattle of pastures receiving different treatments; creep-feeding beef calves for slaughter and breeding pur-

poses; and pigs from Poland China sows mated to Poland China and Duroc-Jersey boars for the production of market hogs.

[**Livestock and poultry experiments by the Tennessee Station**] (*Tennessee Sta. Rpt. 1940*, pp. 18-23, 25-26, 45-48, 49-55, 104, 107, figs. 2).—Brief results are presented by M. Jacob, J. E. Parker, B. J. McSpadden, D. E. Williams, E. Morrell, G. A. Shuey, B. P. Hazlewood, and F. S. Chance of progress on feeding high and low phosphorus roughages for steers; acre yields of steers from corn harvested in various ways; summer gains of steers wintered with and without grain; feeding steers on corn-cob-shuck-meal with and without cottonseed meal; dehydrated sweetpotatoes for fattening yearling steers; shelled corn and barley for pigs; pastures for growing pullets; comparison of alfalfa, sericea, and Korean lespedeza as green feed for chicks; nutrition studies of low and high phosphorus hays for rats and calves; and nutritive value of silage from grasses and legumes.

[**Livestock and poultry investigations by the Washington Station**] (*Washington Sta. Bul. 410 (1941)*, pp. 26-29, 32-33, 36, 92-95).—Brief results are presented by J. Sotola, M. E. Ensminger, H. G. McDonald, M. M. Boggs, J. A. McIntosh, J. Roberts, C. C. Prouty, T. W. Daniel, H. P. Singleton, W. H. Burkitt, M. Rhian, J. L. St. John, K. Groves, R. J. Evans, J. S. Carver, and E. I. Robertson on investigations dealing with the feed efficiency of crested wheatgrass and brome grass singly and mixed with alfalfa and sweetclover for yearling steers; length of freezing period, paper in which to wrap steaks, and the thawing and aging of meat stored in community cold storage lockers; rations for ewes suckling lambs, including alfalfa hay, cull potatoes, sugar beets, rutabagas, beet pulp, and beet molasses; vitamin and protein values of fish oils and meals; the choline and mineral requirements of growing poult; comparative growth response of cockerels and pullets to protein supplements; chemical composition of watery and thick whites of eggs; the effect of minerals, vitamins, and storage on eggshell quality; the inheritance of albumen index in White Leghorn hens; vitamin D requirements of turkey poult; development of a chick ration with soybean meal, fish meal, and dried whey; and choline, soybean meal, pea meal, herring fish meal, liver meal, and a starter for turkey poult.

Response to growth hormone of hypophysectomized rats when restricted to food intake of controls, W. MARX, M. E. SIMPSON, W. O. REINHARDT, and H. M. EVANS. (Univ. Calif.). (*Amer. Jour. Physiol.*, 135 (1942), No. 3, pp. 614-618).—Daily treatment of immature hypophysectomized ♀ rats with growth hormone solution practically free of other pituitary hormones was found to promote increased growth in body weight and most of the organs even though the feed consumption of both groups was made comparable by limitation. Feed consumption was controlled by stomach tube feeding in the first experiment and by the paired feeding method of Mitchell (*E. S. R.*, 63, p. 393) in the second experiment. Evidently the growth hormone caused increased deposition of the hormone through better utilization of the feed consumed.

Fundamentals of livestock rations, C. L. SHREWSBURY. (Purdue Univ.). (*Flour & Feed*, 42 (1942), No. 11, pp. 12, 14).—A concise presentation of the nutritive needs of various classes of livestock.

Vitamins in relation to farm animal nutrition, J. R. HAAG. (Oreg. Expt. Sta.). (*Assoc. Food and Drug Off. U. S., Quart. Bul.*, 6 (1942), No. 2, pp. 10-13).—A brief statement of the role and sources of vitamins in animal nutrition.

Note on "the significance of the pH determination in the evaluation of quality in silages," W. MCLEAN (*Jour. Agr. Sci. [England]*, 31 (1941), No. 4, pp. 518-521).—In the evaluation of quality in silages, color, smell, and dry matter content are the best criteria apart from feeding value because of the possible

effects of overheating on the pH and odor. Silages in the vicinity of pH 4.0 may or may not be of excellent quality.

Soybean-sorghum silage about same as sorghum alone, A. E. CULLISON (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 4, pp. 1, 8).—Little difference in the acre value of sorghum silage when planted with soybeans was apparent as a result of 2-yr. studies (E. S. R., 85, p. 516). With two groups of cattle fed over a 77-day period the average gains in both lots were 46 lb. The chemical composition of the soybean-sorghum silage was slightly superior in protein and nitrogen-free extract.

Commercial feeding stuffs from September 1, 1940, to August 31, 1941, F. D. FULLER and J. SULLIVAN (*Texas Sta. Bul.* 608 (1941), pp. 260).—This report tabulates the guaranteed and found analyses of 3,529 samples of feeds officially analyzed in the State of Texas during the year ended August 31, 1941 (E. S. R., 84, p. 656). In addition there are given the content of fish liver oils for vitamins A and D, carotene in feeds, hardness of cottonseed cake, minerals, poisons, and prices of mixed feeds, with pertinent definitions and standards with which the feed samples must regularly comply.

Versuche über Denaturierung des Futterzuckers mittels der Octoacetylsaccharose [Experiments on denaturizing feed sugar with octoacetylsaccharose], J. KRÍZENECKÝ (*Biedermanns Zentbl., Abt. B, Tierernähr.*, 13 (1941), No. 2, pp. 91–123).—Octoacetylsaccharose proved satisfactory for denaturing sugar, spoiling it for human consumption but leaving it suitable for animal nutrition. Additions of 0.4 gm. of the drug to 1 kg. of sugar made it bitter and repugnant for human use, but additions of 0.6 gm. per kilogram did not affect its desirability for pigeons, chickens, ducks, swine, horses, and dairy cows in rations which were made up of one-fifth of denatured sugar of this sort. Neither milk nor meat were affected by feeding the substance.

Automatic recording of salting and watering habits of cattle, J. R. BENTLEY. (U. S. D. A. coop. Univ. Calif.). (*Jour. Forestry*, 39 (1941), No. 10, pp. 832–836, figs. 5).—The automatic recording of time and amount of salt and water consumed by 16 head of cattle on an experimental pasture of 537 acres with a little more than one-half mile between salting and watering places showed that cattle did not go directly to drink after consuming salt. There was much variation in the time of salting during the 3 mo. July, August, and September. Roughly two-thirds of the salting periods in July were in the afternoon or evening, whereas the periods of salting were roughly two-thirds in the morning in September, with August intermediate. Over 85 percent of the watering periods were in the afternoon or evening. The average interval between salting and watering was 7 hr. and 24 min., with less than 17 percent under 1 hr. and 65 percent over 4 hr.

Horn-tipping apparently no benefit in shipping mature horned cattle, R. H. MEANS (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 4, p. 1).—No differences in the amount of injury were exhibited in two carloads of cows shipped from Wiggins, Miss., to Starkville when the horns of the 41 cows in one car were tipped and those in the other car untipped.

The utilization by calves of the energy contained in balanced rations composed of combinations of different feeds, H. H. MITCHELL and T. S. HAMILTON. (Univ. Ill.). (*Jour. Nutr.*, 22 (1941), No. 6, pp. 541–552).—The metabolizable energy of rations made up of different feeds and at different levels of feeding was approximately equally utilized for maintenance and body increase. Four rations balanced to contain chemically adequate amounts of estimated nutrients from different feeds were fed to four Shorthorn calves with

a repetition of the experiment with four other calves in a second year. The rations were fed to each calf at maintenance and supermaintenance levels. The average fasting heat production for all steers on all rations was 78.51 calories per kilogram of $W^{.75}$, or somewhat higher than the average previously reported (E. S. R., 85, p. 233). The net availability of the metabolizable energy ascertained in the respiration chamber on the two planes of nutrition for the four rations was quite similar. It seems evident from these results that the extent to which the metabolizable energy is utilized for maintenance and body growth is not a function of the particular feed but depends on the adequacy of the combination of digestible nutrients.

The effect of added glucose upon the digestibility of protein and of fiber in rations for sheep, T. S. HAMILTON. (Univ. Ill.). (*Jour. Nutr.*, 23 (1942), No. 2, pp. 101-110).—Additions of 20-30 percent sugar to a basal ration for sheep of timothy, yellow corn, and cottonseed meal were found to increase the apparent digestibility of the dry matter, nitrogen-free extract, and total carbohydrates, but decrease the apparent digestibility of the total nitrogen, crude fiber, and metabolizable energy. There was no significant effect on the apparent digestibility of the fat and gross energy or metabolizability of the ration. A rather marked decrease in the digestibility of the fiber in the sugar rations seemed due to the preferences of the micro-organisms of the paunch for sugar as shown by the increase in metabolic nitrogen in the feces of the sheep on the sugar ration. The studies were conducted in metabolism crates with the basal ration used for cattle (E. S. R., 85, p. 233) with additions of the sugar in double reversal tests with six sheep. The basal ration of 1.64 lb. per 100 lb. live weight was assumed to be adequate for maintenance.

War-time rations for pigs.—Report of experiments with mangolds and biscuit waste, fodder yeast, urea, and dried skim milk, R. BRAUDE and A. S. FOOT (*Jour. Agr. Sci. [England]*, 32 (1942), No. 1, pp. 70-84).—From attempts to fatten pigs with minimum amounts of mixed protein and its replacement in part by urea and yeast rations supplemented by mangolds and biscuit waste in 21-week individual feeding experiments with four to eight 50-lb. pigs, it would appear that a low-protein ration even with urea was too low for optimum growth. The average daily gains of slightly less than 1.0 lb. were increased to 1.1-1.2 lb. by the inclusion of 15 percent dried skim milk, 10 percent fodder yeast, or 24 percent mixed proteins as a supplemental portion of the protein supplement. Where common protein supplements are mixed, the crude protein content should be as high as 16 or 17 percent but the quality is considered important. Some samples of biscuit waste were not very palatable. There was no measurable effect from 20 gm. daily of urea in the nonruminant pig ration even when fed with a ration sufficiently low in protein to restrict growth. Both individual feeding and group feeding gave similar results, but it is believed that large numbers would have been required to make the results of group feeding as clear-cut as those with individual feeding.

Emergency pork production, L. A. WEAVER (*Missouri Sta. Cir.* 225 (1942), pp. [4], fig. 1).—Improved breeding, care, and feeding of swine are suggested to furnish increased amounts of pork efficiently.

The nutrition of the bacon pig.—VII, The chemical composition, digestibility, and nutritive value of different types of swill, H. E. WOODMAN and R. E. EVANS (*Jour. Agr. Sci. [England]*, 32 (1942), No. 1, pp. 85-107).—Continuing this series (E. S. R., 85, p. 517) the chemical nature and feeding and digestibility studies with pigs of meat-rich military camp swill, processed urban swill, and dried balanced swill are reported. The 19-week comparison with rations containing 35, 50, and 95 percent dried swill showed that the animals all remained

healthy and thrifty, but those on a control diet evidenced more bloom and made slightly greater gains than those on the 35 percent swill ration. On the 95 percent swill with 5 percent bran ration the pigs were maintained in good condition, but the gains were only 0.9 lb. per day as contrasted with 1.2 lb. by the control group. There were no differences in the back fat of groups on the control and the 35 and 50 percent dried swill rations, but there was a significant tendency to produce leaner carcasses with thinner back fat on the 95 percent swill rations.

Protein supplements in the feeding of pigs, E. H. HUGHES and N. R. ITTNER (*California Sta. Bul.* 661 (1942), pp. 12).—In a series of experiments involving 25 lots of five to ten 35–50-lb. pigs each, fed about 100 days, barley unsupplemented making up the bulk of the ration was less efficient for growth and fattening than when milk product concentrates were added to the extent of 1.5–3.5 percent of the ration. No difference was found between the value of commercial and purified casein or additions of riboflavin. It was concluded that the barley contained enough of this vitamin to satisfy the needs of the pig. Whey powder and skim milk powder increased gains over no protein supplement, but they were not as good as fluid skim milk, which produced rapid and economical gains. Skim milk powders manufactured by the spray and drum process were about equal, but powder scorched in the manufacturing process was less efficient. No advantage is shown for the inclusion of 5 percent alfalfa meal with 10 percent tankage or fish meal with and without stick as a protein supplement in 60-day tests with 100-lb. pigs. The inclusion of stick with the fish meal showed advantages in rate and feed required per unit of gain.

Mejores cerdos para Puerto Rico [Better swine for Puerto Rico], E. L. WILLETT (*Agr. Expt. [Puerto Rico Univ. Sta.],* 2 (1942), No. 1, p. 6).—The use of Hampshire and Duroc-Jersey swine for improving native stock in Puerto Rico is discussed.

The effect of Beckmann's treatment by sodium hydroxide on the digestibility and feeding value of barley straw for horses, G. WILLIAMSON (*Jour. Agr. Sci. [England],* 31 (1941), No. 4, pp. 488–499).—The coefficients of digestibility of nitrogen-free extract and crude fiber in barley straw as ascertained with three horses were materially improved by treatment of the straw for 12 hr. in 1.25 percent caustic soda, followed by washing and 3 hr. draining. In untreated straw the digestibility of organic matter nitrogen-free extract and fiber were calculated as less than 40 percent, but following the treatment they were increased from 50 to over 60 percent. Analyses of the straw showed that 14.5 percent of the dry matter was lost during the treatment. One young horse brought in from grass and troubled with digestive disorder showed a considerably lower digestibility of the treated material. The nitrogen balances were about equal to or slightly better than were obtained from a poor quality meadow hay.

Heat production of the rabbit at 28° C. as affected by previous adaptation to temperatures between 10° and 31° C., R. C. LEE (*Jour. Nutr.,* 23 (1942), No. 1, pp. 83–90).—Measurements of the heat production of 12 rabbits at 28° C. showed the level to be dependent on the temperature and duration of the temperature to which the rabbits were maintained prior to the metabolism study. In general the rate varied inversely with the change in the previous temperature, with a prolongation of the study causing a greater change. Metabolic adjustments to an increase in temperature took place in about 2–3 weeks. The rabbits were divided into two groups adjusted so that the average weights were approximately equal.

The digestion of cereals by minks and foxes, with special reference to starch and crude fiber, R. BERNARD, S. E. SMITH, and L. A. MAYNARD. (Cornell Univ.). (*Cornell Vet.,* 32 (1942), No. 1, pp. 29–36, fig. 1).

Standard breeds and varieties of chickens.—II, Ornamental and game classes, M. A. JULL (*U. S. Dept. Agr., Farmers' Bul. 1507, rev. (1942), pp. 11+36, figs. 40*).—A revision (E. S. R., 56, p. 669) dealing with the ornamental and game classes of poultry.

El mejoramiento de las aves de Puerto Rico [Improvement of poultry in Puerto Rico], E. L. WILLETT (*Agr. Expt. [Puerto Rico Univ. Sta.], 2 (1942), No. 1, pp. 5, 6, figs. 2*).—The response of native and introduced breeds to local conditions at La Plata.

The carbonic anhydrase activity of the hen's oviduct, R. H. COMMON (*Jour. Agr. Sci. [England], 31 (1941), No. 4, pp. 412-414*).—The higher carbonic anhydrase activity of the uterine epithelium of laying hens than of the oviducal tissues of the nonlaying hens is suggested as playing a part in shell secretion. This work with tissues and extracts from 12 hens suggests that the calcium-secreting cells of the uterus may have a carbonic anhydrase activity greater than other oviducal tissue.

Emergency poultry rations, C. S. PLATT (*New Jersey Stas. Hints to Poultrymen, 29 (1942), No. 3, pp. [4]*).—There are suggested poultry mashes for chicks, developing birds, laying stock, and breeding stock, and methods of feeding. Sources of riboflavin are noted, including lawn clippings and grass silage.

Protein sources in the chick diet, H. J. ALMQUIST. (Univ. Calif.). (*Flour & Feed, 42 (1942), No. 11, pp. 10-11*).—The amino acid contents of several feeds have been combined from various sources with special reference to the requirements of poultry (E. S. R., 85, p. 389) and the possibility of destruction of certain protein values by heat treatment during manufacture.

The calcium requirements of poultry with particular reference to their needs for maintenance, C. TYLER and J. S. WILLCOX (*Jour. Agr. Sci. [England], 32 (1942), No. 1, pp. 62-69, figs. 2*).—The maintenance requirement of calcium by laying and nonlaying birds is about 0.1 gm. and the endogenous calcium about 0.05 gm. The calcium retention and amount in the daily droppings of the above hens showed that with a daily intake of 0.5 gm. the percentage retention was 70, but at 2.0 gm. the maximum percentage retention of about 50 was reached by the laying hens. The percentage retention of the nonlaying hen continued to increase to a daily intake of 3.0 gm. calcium.

Calcium and phosphorus balances with laying birds, C. TYLER and J. S. WILLCOX (*Jour. Agr. Sci. [England], 32 (1942), No. 1, pp. 43-61*).—Daily calcium and phosphorus balances for 35 days showed that on a low-calcium ration supplemented with 2 gm. of cod-liver oil and 2.4 gm. of calcium per day from calcium gluconate, calcium sulfate, and oystershells, four laying hens appeared to be healthy but before the end of the calcium sulfate period a slight nervousness developed and there was some egg eating. Calcium carbonate did not produce scouring and gave eggs having the heaviest shells and calcium sulfate the lightest. As a result of laying, the birds were in negative calcium balance in all except the calcium gluconate period. The greatest retention of phosphorus was shown by the birds receiving calcium sulfate and calcium gluconate and the least retention by birds receiving calcium carbonate. There were small negative phosphorus balances in all birds. There was generally a heavy phosphorus excretion associated with each egg laid. In the discussion of the calcium and phosphorus metabolism in relation to eggshell formation it is pointed out that calcium retention rarely raises above 1.2 gm. per day even though more than 2 gm. of calcium were ingested. The demands of laying may take the calcium from the bone with a consequent surplus of phosphorus (E. S. R., 83, p. 811).

Observations on the mineral metabolism of pullets.—VI, The mobilization of body calcium for shell formation. R. H. COMMON and R. W. HALE (*Jour. Agr. Sci. [England]*, 31 (1941), No. 4, pp. 415-437, figs. 10).—Recent mineral balance trials with laying fowls (E. S. R., 83, p. 811) and the above are discussed with reference to the 28-day calcium balances of the pullets on the two rations noted in the previous paper of this series (E. S. R., 86, p. 518). With the onset of reproductive activity the physicochemical equilibria of the pullet's body are so modified as to lead to increased deposition of calcium in the skeleton. When laying begins on a ration low in calcium recurrent drafts are made on the skeletal calcium. Eventually laying is interfered with and the amount of calcium in the shell falls. Mineral material removed from the shell formation seemed to have a higher calcium : phosphorus ratio than the skeleton as a whole. With rations low in calcium the greater the difficulty with which calcium stored in the skeleton is removed. During molt it was noted that the calcium retention might go on at the same time the birds were losing phosphorus. "It is suggested that some degree of mobilization of skeletal calcium is a normal feature of shell formation in the fowl, the fraction of bone mineral material mobilized always having a higher Ca : P ratio than the skeleton as a whole, although the actual ratio may vary with the calcium in the diet and with the form in which the calcium is provided."

Biotin in chick nutrition. D. M. HEGSTED, R. C. MILLS, G. M. BRIGGS, C. A. ELVEHEIM, and E. B. HART. (Wis. Expt. Sta.). (*Jour. Nutr.*, 23 (1942), No. 2, pp. 175-179).—A type of dermatitis occurring in chicks on a purified ration (E. S. R., 84, p. 803) was prevented by supplements of 10 or 20 μ g. of biotin per 100 gm. of the ration, but 5 μ g. of biotin was insufficient. Growth and the biotin content of the liver and kidney were increased with larger amounts and with 3 percent of kidney residue and 10 percent of molasses. From the results it is concluded that the chick requires 7-10 μ g of biotin per 100 gm. of ration.

The pantothenic acid requirement of chicks. J. C. BAUERNFEIND, L. C. NORRIS, and G. F. HEUSER. (Cornell Univ.). (*Poultry Sci.*, 21 (1942), No. 2, pp. 142-146, fig. 1).—For the prevention of dermatosis Single-Comb White Leghorn chicks were found to require from 500 to 550 μ g. of pantothenic acid per 100 gm. of the diet and approximately 600 μ g. for maximum growth. These results were obtained in three experiments in which 15 and 16 chicks per lot were fed on rations containing about 300 to 600 μ g. of pantothenic acid per 100 gm. of diet assayed by methods previously referred to (E. S. R., 87, p. 257). Growth rates, mortality, severity of dermatosis, and pantothenic acid content of the livers were reported for feeding up to 6 weeks of age on the different rations. A fourth experiment with 20 chicks showed the pantothenic acid requirement of Rhode Island Reds to be approximately 75 μ g. less per 100 gm. of diet than that of Single-Comb White Leghorn chicks. Attention is called to differences in the chick requirement of 1.4 mg. per 100 gm. of diet noted by Jukes (E. S. R., 82, p. 93).

The need for pantothenic acid and an unidentified factor in reproduction in the domestic fowl. M. B. GILLIS, G. F. HEUSER, and L. C. NORRIS. (Cornell Univ.). (*Jour. Nutr.*, 23 (1942), No. 2, pp. 153-163).—Pantothenic acid was required in the diet of the hen for a hatchability of the eggs of about 10-30 percent. A heat-stable factor was present in liver extract needed in addition to pantothenic acid to increase the hatchability to 50-60 percent. The pantothenic acid deficient ration produced a dermatosis in chicks, and when fed to depleted hens for 7 weeks about 80 percent developed a mild form of dermatosis on the feet and lower shanks. The condition was not exhibited by pullets with a normal diet. The experiment was conducted with 5 lots of 12 pullets each

kept 8 weeks on a treated depletion diet followed by 10 weeks on a basal heated diet to destroy pantothenic acid with supplements of pantothenic acid, liver extract, and yeast filtrate in various combinations. The experiment was completed with a 10-week period in which the supplements were altered to substantiate the conclusions.

Vitamins required by pigeons, J. G. LEE and A. G. HOGAN (*Missouri Sta. Res. Bul.* 342 (1942), pp. 15, fig. 1).—The anemia in pigeons on a deficiency diet (E. S. R., 84, p. 382) resulted from a multiple deficiency of several vitamins. Thiamin, riboflavin, pyridoxin, and pantothenic acid were all required for weight maintenance. A combination of a fuller's earth adsorbate of tikitiki, a fuller's earth adsorbate of liver extract, and a charcoal adsorbate of liver extract filtrate supplied all of the water-soluble vitamins needed by mature pigeons. In a series of experiments, pigeons were forced to lose about 30 percent of their body weight, and anemia developed in about 3–4 weeks. Normality was restored when the ration was supplemented with all three of these substances, but combination of any two of them was partially incomplete. There is no indication of the number of vitamins supplied, but attention is called to the fact that the fuller's earth adsorbates supplied pyridoxin and the charcoal adsorbate supplied pantothenic acid. Although the effects of purified vitamins were not conclusive, it appeared that a deficiency of thiamin, riboflavin, pyridoxin, or pantothenic acid caused loss in weight. Deficiencies of either pyridoxin or pantothenic acid led to anemia and a loss in weight. Some evidence was offered that pigeons required nicotinic acid, but they did not appear to need choline or inositol.

DAIRY FARMING—DAIRYING

[Abstracts of papers presented at the thirty-fourth annual meeting of the American Society of Animal Production] (*Jour. Anim. Sci.*, 1 (1942), No. 1, pp. 66, 67, 68).—The following papers pertaining to dairy production problems are noted: The Influence of Inbreeding on Birth Weight, Rate of Growth, and Type of Dairy Cattle, by J. W. Bartlett, R. P. Reece, and O. L. Lepard (pp. 66–67) (N. J. Expt. Stas.); Peanut Meal for Dairy Cattle, by F. R. Edwards (p. 67) (Ga. Sta.); The Value of Molasses- and Phosphoric Acid-Alfalfa Silages in the Rations of Dairy Cows, by W. A. King, G. C. Patrias, and W. C. Russell (pp. 67–68) (Rutgers Univ.) (E. S. R., 86, p. 374); The Relation of Carotene Intake to Blood Carotene Values of Dairy Cattle, by A. H. Kuhlman and W. D. Gallup (p. 68) (Okla. A. and M. Col.); and The Effect of Shark Liver Oil Feeding Upon Milk Production and Blood Vitamin A, by I. W. Rupel, P. D. Boyer, and P. H. Phillips (p. 68) (Univ. Wis.).

[Experiments with dairy cattle and dairy products in New Jersey] (*New Jersey Stas. Rpt.* 1941, pp. 11, 14–17, 20–21, 22, 24–25, pl. 1).—Studies, for which results are briefly reported, include the economic importance of raising needed replacement stock on the dairy farm, factors in barn construction relating to the health of dairy calves, methods for conserving the vitamin A value in hays, a comparison of alfalfa or alfalfa and timothy silages v. corn silage for dairy cattle and other studies concerning the preparation and use of grasses and legume silages with molasses or phosphoric acid as preservatives, feeding methods to insure good flavor and color in winter milk, the relation of endocrine factors to mammary gland growth and the initiation of milk secretion, a comparison of the arithmetic average v. weighted average in computing the fat percentage in the milk of cows having two or more production records, and the short-time high-temperature method v. the standard holder method for milk pasteurization.

[**Dairy investigations in New Mexico**] (*New Mexico Sta. Rpt. 1941*, pp. 66-67, 68).—Progress reports (E. S. R., 85, p. 239) are presented for experiments on the relative carotene and vitamin A content of the blood, liver, and butterfat of cows and goats receiving a ration of hegari fodder and cottonseed meal with or without supplementary Sudan grass pasture; the potency of the grass-juice factor in milks produced on the various rations; and milk goat breeding investigations.

[**Investigations with dairy cattle and dairy products in South Carolina**] (*South Carolina Sta. Rpt. 1941*, pp. 74, 75-77, 81-88, figs. 5).—Experiments for which results are reported include the use of dried whey in the ration of unthrifty dairy calves, by G. H. Wise; a combination of colostrum and reconstituted skim milk as a substitute for whole milk in the ration of the growing dairy calf, by Wise and J. P. LaMaster; the effect of rotational and continuous grazing by dairy cows on the carotene content of the pasture herbage and of the milk, by J. H. Mitchell, E. J. Lease, D. B. Roderick, and Wise; and the utilization of a mountain tunnel for the curing of blue mold cheese, by P. G. Miller.

[**Dairy investigations in Tennessee**] (*Tennessee Sta. Rpt. 1940*, pp. 30-45, figs. 9).—From dairy cattle investigations by S. A. Hinton, C. E. Wylie, G. A. Shuey, and J. A. Schaller results are presented on a comparison of sericea silage, alfalfa silage, and corn silage for dairy cows; the feeding value of barn-dried v. field-dried hay; and the improvement of purebred dairy herds through the continuous use of proved sires. Findings are noted also on the influence of certain rations on the flavor score of milk from individual cows, factors influencing the oxidized flavor development in milk, and the development and use of an experimental laboratory pasteurizer, all by H. B. Henderson, T. B. Harrison, Hinton, and Wylie.

[**Investigations with dairy cattle and dairy products in Washington**]. (Partly coop. U. S. D. A. and West. Wash. Expt. Sta.). (*Washington Sta. Bul. 410 (1941)*, pp. 37, 38, 39, 40, 40-42).—Progress reports (E. S. R., 85, p. 521) are presented for the following lines of investigation: The improvement of a Holstein dairy herd through the continuous use of proved sires, by F. B. Wolberg and J. C. Knott; the clipping and grazing methods of measuring pasture yields, by R. E. Hodgson, Wolberg, and Knott; the manufacture, ripening, and development of foreign varieties of cheese, the relative gas requirements of various dairy molds, and the suitability of certain dairy products for frozen-pack methods and canning of cheese for storage, all by N. S. Golding; the development of special varieties of cheese suitable to Washington conditions, and a study of the roll tube and standard plate methods for making bacterial counts of milk, both by H. A. Bendixen and C. C. Prouty.

[**Progress of dairy research in Scotland**] (*Hannah Dairy Res. Inst., Ann. Rpt., 12 (1941)*, pp. 19, pls. 4).—A description of the research activities of the institute, with titles and references to papers published during the year ended March 31, 1941 (E. S. R., 85, p. 239).

[**Profitable permanent pastures for dairy cattle**, D. M. SEATH (*Louisiana Sta. Bul. 341 (1942)*, pp. 15, figs. 7).—The results of a 5-yr. permanent pasture improvement experiment involving variable management and fertilization practices on each of three soil types in the State are summarized. The results of the individual tests were in general agreement with the average of all tests, which indicated that over a 4-yr. period the annual application of 350 lb. of a 4-12-4 fertilizer per acre in the fall plus 50 lb. of nitrate of soda per acre in the spring resulted in 58 percent more cow-days of grazing, 64 percent more milk, and \$16.05 per acre, or 44 percent, more returns over cost of grain fed and fertilizer used as compared with unfertilized pastures. In the fifth year of the trial the previously unfertilized pastures showed a very marked response to

an application of basic slag, while pastures in the regularly fertilized series continued to show an improvement through the fifth year. Other practical recommendations for the improvement of permanent pastures are included.

The effect of fineness of grinding grain on milk production, T. M. OLSON (*South Dakota Sta. Bul. 358 (1942), pp. 8, figs. 2*).—In a further report (E. S. R., 86, p. 234), feeding trials and digestion experiments were conducted in which a ration of corn and oats in equal parts by weight and alfalfa hay was fed throughout, with the grains coarsely ground in one case and finely ground in the other. The coarsely ground grains were more palatable, but the degree of fineness of grinding had no appreciable effect on the live weight of the animals or the digestibility of the ration. A slightly greater amount of total digestible nutrients per unit of milk and butterfat produced was required when the finely ground grains were fed, leading to the conclusion that coarsely ground grain is equal or superior to finely ground grain for milking cows.

The advantage of grinding Atlas sorghum grain for dairy cows, F. W. ATKESON and G. H. BECK. (Kans. Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 3, pp. 211-220).—When two dry cows (one Holstein and one Jersey) were fed whole, coarsely ground, or finely ground Atlas sorgho grain in combination with alfalfa hay, 42.0, 4.8, and 1.5 percent of the grain, respectively, was recovered in the feces. When immature sorgho silage with a grain content of only 1.3 percent was fed as the sole ration, 10.7 percent of the grain was recovered in the feces. On a ration of Atlas sorgho fodder, sorgho silage, and sorgho grain, 23.0 percent of coarse and 11.3 percent of finely ground grain was recovered, and when the silage was omitted recovery averaged 23.0 and 11.4 percent, respectively. When the above ration plus cottonseed meal and bonemeal was fed recovery of coarse and fine grain averaged 16.2 and 6.5 percent, respectively, with silage included, and 19.7 and 10.8 percent when silage was omitted. When a balanced ration of alfalfa hay, sorgho silage, and a grain mixture of sorgho grain, wheat bran, and cottonseed meal (8:4:1) was fed, the recovery of coarse and fine grain averaged 4.0 and 2.7 percent, respectively, and when silage was omitted 2.5 and 1.1 percent.

Deterioration in stored feed, L. L. MADSEN. (U. S. D. A.). (*Assoc. Amer. Feed Control Off., Off. Pub.*, 1942, pp. 48-54).—A general discussion, with particular reference to changes in vitamin content, including vitamins A, D, and E, increase in fatty acids, decrease in solubility and nutritive value of proteins, loss of minerals, and the development of toxic substances in spoiled feeds. As practical measures it is suggested that only high-quality feeds should be selected for storage; grains should not be ground before prolonged storage; the constituents used in the compounding of mixed feeds should be stored separately under suitable conditions to insure maximum stability of essential nutrients; and mixed feeds should be used within about 1 mo. after preparation whenever possible.

Development of the dairy helper, W. C. COWSERT (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 4, pp. 1, 2).—A general discussion, including a table of normal weight and height data for the major dairy breeds.

Feeding and management of dairy calves, C. H. STAPLES and D. M. SEATH (*Louisiana Sta. Bul. 342 (1942), pp. 16, figs. 3*).—A practical handbook on the feeding and management of dairy calves and heifers, supplementing an earlier publication of this station (E. S. R., 72, p. 96).

Magnesium studies in calves.—II, The effect of magnesium salts and various natural feeds upon the magnesium content of the blood plasma, C. F. HUFFMAN, C. L. CONLEY, C. C. LIGHTFOOT, and C. W. DUNCAN. (Mich. Expt. Sta.). (*Jour. Nutr.*, 22 (1941), No. 6, pp. 609-620).—Continuing this series (E. S.

It., 73, p. 673), experimental calves were reared on a basal diet of whole milk supplemented with iron, copper, and manganese, with or without the addition of starch or cereal. In the absence of supplementary magnesium, hypomagnesemia invariably resulted from feeding the basal diets. A total daily intake of from 30 to 40 mg. of magnesium per kilogram of body weight, with magnesium added in the form of pure salts, was required to maintain normal plasma values, and the same amount of magnesium in the form of alfalfa ash was even less effective than the pure salts. However, a total intake of from 12 to 15 mg. per kilogram of body weight proved adequate when small amounts of either corn, alfalfa hay, or corn gluten meal were included in the basal ration, suggesting that the utilization of magnesium was more efficient when furnished by natural feeds than as pure salts.

Bloat in cattle, H. I. COLE, S. W. MEAD, and M. KLEIBER (*California Sta. Bul.* 662 (1942), pp. 22, figs. 9).—Using cows with rumen fistulas, which could be closed with a specially designed plug, the amount and composition of gases produced in the rumen were determined when three types of rations were fed. The largest amount of gas production resulted from the feeding of alfalfa hay and concentrates, followed in order by alfalfa hay alone and green alfalfa alone. The amount of gas formed was more closely related with the time after feeding than with the nature of the ration and was directly related to the amount of feed eaten. The composition of the rumen gas was not affected by the type of feed used. Oxygen, carbon dioxide, and methane gas were each artificially introduced into the rumen in amounts up to 150 l. in 30 min. without ill effects. Belching occurred when the pressure was raised in the rumen by means of an active contraction of the rumen muscles. However, increased pressure, in itself, as brought about by artificial introduction of gas did not force gas from the rumen through the esophagus. The theory is advanced that expulsion of gas from the rumen by belching is a reflex mechanism dependent upon an adequate amount of fibrous material of a prickly nature, and that succulent legumes or concentrates of relatively low fiber content are particularly conducive to bloat. The introduction of sufficient fiber in the ration to induce belching is suggested as a preventive measure. Other theories regarding the cause of bloat are reviewed.

[Abstracts of papers presented at the forty-third general meeting of the Society of American Bacteriologists] (*Jour. Bact.*, 43 (1942), No. 1, pp. 45-47, 59-60, 61).—Abstracts are given of the following papers of significance in dairying: The Bacteria in Brick Cheese During Ripening, by E. M. Foster, J. C. Garey, and W. C. Frazier (Univ. Wis.) (pp. 45-46); Microorganisms Associated With Gassy Swiss Cheese, by H. H. Weiser (Ohio State Univ.) (p. 46); Cheese Defects and Cheese Diseases, by W. Dorner (pp. 46-47); The Fermentation of Alfalfa Silage Preserved With Molasses, Phosphoric Acid, Salt, and Inoculation, by R. C. Malzahn, S. I. Bechdel, and R. W. Stone (Pa. State Col.) (pp. 59-60); and The Quality of Milk in a Large Section of Virginia as Affected by the Constant Occurrence of *Streptococcus lactis* Variety *tardus* and *Bacillus albolactis*, by F. S. Orcutt (Va. A. and M. Col.) (p. 61).

Bacteriological problems in short time, high temperature pasteurization, H. WEINSS (*Milk Dealer*, 31 (1941), No. 1, pp. 106-112).—This more detailed report (E. S. R., 85, p. 520) points out the shortcomings of the plate count, direct microscopic count, or methylene blue reduction test on raw milk for detecting the presence of thermophilic micro-organisms in milk supplies and the advantage of using the resazurin test for this purpose.

Studies of lipase action, IV-VII. (Cornell Univ.). (*Jour. Dairy Sci.*, 25 (1942), No. 3, pp. 231-248, figs. 11).—Four additional reports in this series are noted (E. S. R., 81, p. 413).

IV. *The inactivation of milk lipase by heat*, V. N. Krukovsky and B. L. Herrington (pp. 231-234).—Lipolytic activity in butter during storage was measured by titration of the free acid in the fat of lots made from fresh cream subjected to heat treatment ranging from 110° to 180° F. and held from 0 to 150 min. At 110° lipolysis was first activated and then reduced as the holding time increased, with about two-thirds reduction at 150 min. Lipolysis was reduced about one-half after 20 min. at 125°, but was still measurable after 150 min. At 140° lipolysis was reduced more than one-half at zero holding time, and completely inactivated after 35 min. At 155° lipolysis was scarcely measurable after 0 min. of holding.

V. *The effect of storage temperature upon lipolysis in butter*, V. N. Krukovsky and B. L. Herrington (pp. 234-236).—A comparison of lipolytic activity in butter samples held for over 1 yr. at temperatures ranging from 32° to -15° indicated that the natural lipase remained active at from 30° to 32°, but was entirely inhibited at 5° or lower. There was no apparent difference in the abilities of formaldehyde-tolerant and formaldehyde-sensitive enzymes to act at low temperatures.

VI. *The effect of lipolysis upon the flavor score of milk*, V. N. Krukovsky and B. L. Herrington (pp. 237-239).—Three selected lots of milk of low, medium, and high lipolytic activity, respectively, were each divided into sublots, which were (1) pasteurized, (2) held in the natural state, and (3) activated by heat treatment. Eight samples of each were then stored at from 0° to 5° C., and one of each was scored and analyzed for free fatty acids at hourly intervals. The results indicated that very slight degrees of lipolysis may influence the judge's score without his being aware of the reason, while the threshold value for recognition of rancidity was at an acid degree near 0.8. An increase of 0.33 acid degree corresponded to a decrease of one point in the flavor score of milk.

VII. *The influence of the rate of cooling upon the subsequent rate of lipolysis in milk stored at low temperatures*, B. L. Herrington and V. N. Krukovsky (pp. 241-248).—The results of five separate experiments dealing with the effect of rate and degree of cooling of milk on lipolytic activity are reported. It is concluded that the rate of cooling largely determines the rate of lipolysis in milk when stored at low temperature, and a minimum lipolysis occurs when the cooling time is reduced to a few seconds. The critical temperature range in which rate of cooling was most important had an upper limit of 20° to 25° and a lower limit of approximately 0° in the case of natural milk or 10° in the case of heat-activated milk.

Twenty-seventh annual report of the creamery license division, T. H. PINNEY (*Indiana Sta. Cir.* 268 (1941), pp. 15).—This is the usual report (E. S. R., 85, p. 812) of the number of creamery licenses issued and testers examined and licensed during the year ended March 31, 1941. The licensed dairy manufacturing plants in the State on October 1, 1941, are listed.

Laboratory studies on development of mold in cream, J. D. WILDMAN (*Jour. Assoc. Off. Agr. Chem.*, 24 (1941), No. 1, pp. 183-190).—Restricting the air supply had some retarding effect upon the development of *Oospora lactis*, but temperature of storage and the relative quantities of the inoculum present were apparently more important influences. Cooling the cream to 20° C. resulted in less growth of the mold than occurred at higher temperatures. Mold did not develop in large amounts within 5-day periods when fresh cream was added twice a day and stirred in and a temperature of 20° was maintained unless large quantities of *O. lactis* were present. In most instances cream treated similarly but held at 30° developed much mold when an initial contamination of 1 *O. lactis* or more per cubic centimeter was present.

Factors affecting mold content and quality of cream, P. R. ELLIKER and W. H. BROWN (*Indiana Sta. Bul.* 465 (1942), pp. 15, fig. 1).—Results of a series of experiments on the effect of method of separation, cleanliness of utensils, storage temperature, length of storage period, agitation of cream during the gathering period on the farm, fat content of the cream, and size of shipment on the mold content and quality of cream are summarized. Practical recommendations for the production of high-quality cream, based on these experiments, include proper cleaning, sterilizing, and drying of all utensils, the use of a centrifugal separator wherever possible, prompt cooling of the freshly separated cream, little agitation during the gathering period, storage at as low a temperature (above freezing) as possible, frequent delivery, and the use of relatively small containers consistent with the volume of cream produced.

Effect of holding cream in the buying station upon the mold content and certain other quality factors, R. W. MORRISON, F. E. NELSON, and W. H. MARTIN. (Kans. Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 3, pp. 195–202).—A comparison of organoleptic grades, titratable acidity, visual mold score, and total mold and yeast counts on 10-gal. lots of cream before and after holding periods of 1 to 2 days at temperatures ranging from 68° to 100° F. showed a marked increase in acidity and loss of flavor score but relatively little change in visual mold score during the holding period. It is concluded that the visual mold test used as an index of quality of cream for buttermaking does not reflect the changes which occur during holding in the cream station.

The effect of flash pasteurization and subsequent treatment on the phosphatase value of cream, W. H. BROWN and P. R. ELLIKER. (Ind. Expt. Sta.). (*Jour. Bact.*, 43 (1942), No. 1, pp. 118–119).—Considerable variation was encountered in the phosphatase reaction of creams subjected to flash pasteurization. Phosphatase values generally were negative or slightly positive immediately after pasteurization, but when cream was held in storage at temperatures as low as 4.4° C. the phosphatase value increased. Prolonged cooling after pasteurization tended to produce the same phenomenon. In comparing salted and unsalted creams stored at temperatures ranging from 15.6° to 32.1° for 24 hr. following pasteurization, it was found that similar phosphatase values were obtained for both creams by the Scharer test, whereas the phosphatase value of the salted cream was greater than that of the unsalted as measured by the modified Kay and Graham test. When creams were stored at a temperature of 4.4° or lower this test gave similar values on both lots.

The deterioration of butter during storage, II–IV, W. L. DAVIES (*Jour. Indian Chem. Soc., Indus. and News Ed.*, 4 (1941), No. 3, pp. 150–163, figs. 2; pp. 175–178, 179–183).—Three reports in this series are noted.

II. Development of tallowiness.—A comparison of several methods for detecting the development of tallowy flavor in butter indicated that the sense of taste was by far the most sensitive, followed in decreasing order of sensitivity by peroxide content, the Schiff test for aldehydes, oxidizability values, and the Kreis test. The oxidation of butterfat was strongly catalyzed by traces of copper, less strongly though significantly catalyzed by iron, cobalt, nickel, silver, or chromium, while tin and aluminium had no catalytic effect. In the presence of these metals free fatty acids had only a slight effect in catalyzing oxidation. The presence of heavy metals prevented the development of butyric rancidity in fresh butter and markedly reduced the amount of free volatile and total free fatty acids formed in storage butter.

III. Free acidity.—Determination of the titratable acidity in various lots of butter expressed as cubic centimeters of 1.0 N-alkali per 100 gm. gave the following mean values: Fresh butter 1.97 (0.93 to 3.60), old tallowy butter 4.3

(3.5 to 5.6), and old moldy butter 10.3 (4.5 to 19.7). The free fatty acids were mostly C_{16} - and C_{18} -acids, with free oleic acid appearing in the greatest concentration. The progressive increase in acidity with age led to acid tallowness.

IV. Mouldiness and ketonic rancidity.—Sterilized samples of butter were inoculated with pure cultures of *Oidium*, *Oospora*, *Penicillium*, *Monilia*, and *Cladosporium* and incubated in the dark at 15° [C.]. Examination and analysis of the moldy samples gave evidence that mold growth caused both an acid-oxidative rancidity, due to lipolytic activity of the molds plus their ability to metabolize glycerol, and a ketonic rancidity due to dry molds fructifying on the surface of butter with accompanying discoloration. The acid-producing molds resulted in fishy flavor before tallowness was evident. The dry molds acted mainly on the water-soluble volatile fatty acids.

Devices for measuring physical properties of cheese, L. A. ROGERS and G. P. SANDERS. (U. S. D. A.). (*Jour. Dairy Sci.*, 25 (1942), No. 3, pp. 203-210, figs. 5).—This report describes three pieces of apparatus devised to measure various properties of cheese curd, particularly of Swiss cheese. The first is a delicate curd-tension meter for use in vat or kettle milk, which measures the time required for a standard knife, actuated by a controlled force, to move a definite distance through the coagulating milk. The second is an elastometer in which the resistance of a standard disk of cheese supported over a fixed orifice against controlled air pressure is measured. The third is a plastometer which measures the pressure required to cause a standard plug of cheese to flow and the amount which flows through a fixed orifice in a given period of time.

The relation of the use of certain antioxidants and methods of processing to the keeping quality of powdered whole milk, H. A. HOLLENDER and P. H. TRACY. (Univ. Ill.). (*Jour. Dairy Sci.*, 25 (1942), No. 3, pp. 249-274, figs. 19).—A comparison of the antioxidative properties of eight different substances when added in appropriate amounts to powdered whole milk condensed to the ratio of 3.59:1 gave evidence that gum gualac and hydroquinone were highly effective antioxidants, ascorbic acid and sodium citrate intermediate in effectiveness, and butyl ester of tyrosine, Avenex, Enzylac, and bacterial culture of relatively low effectiveness. A study of the effect of various processing methods indicated that powder from milk heated to 170° F. for 30 min. was less susceptible to oxidized flavor development than that heated at 190° or 150°. A moisture content above 5 percent and a storage temperature above 20° tended to increase the rate of oxidized flavor development, while these same conditions and the presence of added copper or preheating at 190° were conducive to brown discoloration of the powder during storage. Air-resistant containers with lacquering in the case of tin or treatment with oat flour in the case of paper bags were effective in maintaining a normal condition of the powder during storage. Discoloration, reduction in solubility, and a lowering of pH occurred concurrently, suggesting a common cause. The addition of sodium citrate to the milk before drying greatly increased the solubility of the powder. The peroxide value was of little use in detecting early oxidation of the fat or in predicting the keeping quality of a fresh sample.

Relation of chocolate milk to total fluid milk consumption, M. A. SCHAARS and G. HADARY. (Univ. Wis.). (*Milk Plant Mo.*, 31 (1942), No. 3, pp. 28-29, 33).—Based on a survey of 247 families, 73 of which purchased some commercial chocolate milk, it was found that the per capita consumption of fluid milk by the families that bought chocolate milk was 21 percent greater than that of the families which did not purchase it. This trend held true in each of three income groups, as well as in each child per family group when the families were so subdivided.

The significance of tannic substances and theobromine in chocolate milk, W. S. MUELLER. (Mass. Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 3, pp. 221-230, figs. 2).—Feeding trials with young albino rats were conducted in which controlled amounts of pure theobromine, pure crystalline tannic acid, cocoa powders of high and low content of tannic substances, and a concentrated extract of cocoa were added to the basal ration. The theobromine was nontoxic at a 0.27-percent level in the ration. Tannic acid was toxic when the ration contained 2 percent of this substance. Cocoa powder containing 12.15 percent of tannic substances was more toxic than powder containing only 2.67 percent, although the two powders were equal in theobromine plus caffeine content. However, the tannic substances from cocoa were less toxic than pure tannic acid. Concentrated extract of cocoa at an 8-percent level was nontoxic. None of the materials exerted a significant influence on the hemoglobin levels of the blood. It is concluded that toxicity from cocoa can be greatly reduced by the use of a product low in tannic substance, or preferably an extract of the cocoa.

The effect of dextrose and sucrose sugars upon the properties of ice cream, W. H. E. REM and K. R. MINERT (*Missouri Sta. Res. Bul.* 339 (1942), pp. 27, figs. 8).—Four series of experimental ice creams were studied. Series 1, 2, and 3, each with 12 percent fat and 11 percent total solids, contained 15, 12, and 10 percent sucrose and 0, 3, and 5 percent dextrose, respectively, while series 4, with 10 percent fat and 13 percent total solids, contained 10 and 5 percent of sucrose and dextrose, respectively. A partial substitution of dextrose for sucrose had no significant effect on acidity, pH, viscosity, or specific gravity of the mix. All series of ice creams frozen in a continuous freezer had a finer and closer texture than those frozen in the batch freezer. Those containing dextrose were slightly less sweet than those containing all sucrose, although the difference was not marked until one-third replacement of sucrose was made. The resistance of the ice creams to melt-down temperatures was related to the amount of dextrose present. At a drawing temperature of 24° F. either from the batch or continuous freezer there was no marked difference in the body and texture of the resulting ice creams. When drawn at 22°, however, ice cream containing only sucrose had smaller ice crystals than the ice cream containing dextrose. With each additional increment of dextrose it appeared desirable to lower the drawing temperature of the ice cream. In general, the properties of ice cream containing variable increments of dextrose when compared with those containing all sucrose were not greatly affected by the variations in freezing procedure introduced in this study.

The effect of cultures and the relation of acid standardization to several of the physical and chemical properties of ice cream, W. H. E. REM and L. E. SMITH (*Missouri Sta. Res. Bul.* 340 (1942), pp. 32, figs. 12).—Based on a study of 36 experimental ice creams, it is concluded that "the use of high-quality bacterial cultures offers a means of developing a distinctive and desirable 'culture' flavor in ice cream." Best results were obtained by inoculating a small portion of the original mix with 2 percent of high-quality culture and ripening to an acidity of 0.85 percent and then adding a sufficient quantity of the "starter" mix to the original mix before pasteurization to standardize the batch at 0.24 percent acidity. Cultured ice creams in which acidity was developed by the addition of 2 percent of culture and aging until the desired acidity was reached were lacking in a desirable culture flavor. The cultured ice cream retained a good flavor over a storage period of 5 mo. More than the theoretical amount of standardizing agent was required to reduce the acidity of the mix below normal, presumably due to the buffering capacity of the mix constituents. Increasing the serum solids content of the ice cream

resulted in a sweeter flavor, smaller ice crystals and hence a smoother texture, and a more rapid and smoother melt-down. Increasing overrun in these high solids mixes increased the number of small air cells with a resulting impairment of texture and an increase in the stability of the ice cream. The acid standardizing agent used in these trials tended to reduce the shrinkage of ice cream during storage.

VETERINARY MEDICINE

[Work in animal pathology by the New Jersey Stations] (*New Jersey Stas. Rpt. 1941*, pp. 21-22, 31-32).—The work of the year (E. S. R., 84, p. 813) reported relates to mastitis of dairy cows, Bang's disease, and pox vaccine for immunization of chickens.

[Work in animal pathology and parasitology by the Washington Station] (*Washington Sta. Bul. 410 (1941)*, pp. 35-36, 97-99).—The work of the year (E. S. R., 85, p. 527) reported relates to the toxicity of lead arsenate spray residues to pigs, by K. Groves and J. L. St. John; poisonous constituents of *Amsinckia intermedia*, by Groves; factors responsible for the development and spread of mastitis in dairy herds, efficiency of natural disinfectants and of disinfectants commonly used on poultry farms, and lamb dysentery, all by E. C. McCulloch; studies on fowl leucosis and the efficiency of phenothiazine and related products in removing and controlling internal parasites in poultry, both by McCulloch and L. G. Nicholson; and swine arthritis, by H. G. McDonald and McCulloch.

Poisonous plants of South Dakota, J. K. EDWARDS (*S. Dak. Acad. Sci. Proc.*, 21 (1941), pp. 22-33).—Information on the plants of South Dakota that cause a loss of livestock through poisoning is presented in table form, the arrangement being by plant families. The data include scientific and common names, distribution, poisonous principle, and the symptoms caused and treatment suggested.

Rate of formation and disappearance of methemoglobin following oral administration or injection of sodium nitrite, C. W. JENSEN and H. D. ANDERSON. (*S. Dak. Expt. Sta.*). (*S. Dak. Acad. Sci. Proc.*, 21 (1941), pp. 37-40).

Textbook of bacteriology, E. O. JORDAN and W. BURROWS (*Philadelphia and London: W. B. Saunders Co., 1941*, 13. ed., rev., pp. XII+731, figs. 170).—A revised and completely rewritten edition of this work (E. S. R., 80, p. 818).

Further observations on the longevity of dry spores of B[acillus] anthracis, G. S. GRAHAM-SMITH (*Jour. Hyg. [London]*, 41 (1941), No. 5-6, p. 496).—Supplementary observations (E. S. R., 63, p. 872) are noted.

Eimeria antilocaprae, a new coccidium from the American antelope, H. HUIZINGA. (*Wyo. Expt. Sta.*). (*Jour. Parasitol.*, 28 (1942), No. 2, pp. 167-168, figs. 2).

Period of protection afforded by sulphur in prevention of *Eimeria tenella* infections, O. E. GOFF. (*La. Expt. Sta.*). (*Poultry Sci.*, 21 (1942), No. 2, pp. 155-160).—Experimental work on (1) the lasting effect of flowers of sulfur in coccidiosis (*E. tenella*) prevention, (2) the time required for flowers of sulfur to provide protection from infection by this parasite, and (3) the stage in its life cycle affected by flowers of sulfur is reported. The findings show the sporozoite stage of this parasite to be that primarily affected by flowers of sulfur. "Rations containing 5 percent Number 10 hardwood charcoal with 2 or 5 percent flowers of sulfur, or 5 percent sulfur without charcoal, gave as great protection from coccidiosis after feeding 1 day as when fed 3 or 5 days before inoculation. The same was true probably of a ration containing .2

percent flowers of sulfur without charcoal; however, the results were less exact in this instance. Chicks were highly susceptible to an invasion of sporulated *E. tenella* within 24 hr. after sulfur or sulfur with charcoal was withdrawn from the ration. Therefore, sulfur does not have the ability to create a permanent resistance to coccidiosis. Sulfur was of value as a preventive only while in the intestines. It was indicated that sulfur and sulfur products act directly upon the parasite and do not condition the intestinal lining to make it more resistant, or less impervious, to an invasion of coccidia. Sulfur should be considered as an aid to sanitation and not as a substitute for sanitation. Flowers of sulfur has value in prevention of *E. tenella* infection, but has no value as a cure."

Unsuccessful attempts to transmit encephalomyelitis from horses to guinea pigs by endoparasites, A. O. FOSTER and M. S. SHAHAN. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc.*, 9 (1942), No. 1, pp. 20-21).

Helminths of tree squirrels in southeast Texas, A. C. CHANDLER (*Jour. Parasitol.*, 28 (1942), No. 2, pp. 135-140, figs. 3).—In the examination of 13 fox squirrels (*Sciurus niger rufirenter*) and 4 gray squirrels (*S. carolinensis carolinensis*) from east Texas, *Railletina* (*Railletina*) *bakeri* n. sp. was found in a majority of the adult animals; *Cysticercus tenuicollis* in one specimen; *Strongyloides robustus* n. sp. in all adult animals; *Heligmodendrium hassalli* in all animals, even those not full grown; and two kinds of microfilariae, each occurring once.

Hymenolepis mastigopraedita, a new cestode from a pintail duck, S. J. FORK. (Okla. A. and M. Col.). (*Jour. Parasitol.*, 28 (1942), No. 2, pp. 141-145, figs. 4).

A case of listerellosis in chickens and an additional case in sheep, H. A. HOFFMAN and C. LENARZ (*Jour. Amer. Vet. Med. Assoc.*, 100 (1942), No. 781, pp. 340-342).—In the work reported an organism of the genus *Listeria* was isolated from a hen affected with lymphomatosis, but because of this complication it was impossible to determine the extent to which the infection contributed toward the death of the bird. The culture was found fatal for mice but failed to kill chickens in doses of 1.0 cc. intravenously. A second organism of the genus was isolated from a sheep, emulsified brain material from which, when injected subdurally, was fatal to one rabbit and produced definite symptoms in another. It was not found fatal for chickens in doses of 1.0 cc. administered intravenously. The serological relationship of these organisms was demonstrated by agglutination tests. A similar relationship with a strain isolated previously from a sheep was also demonstrated.

Chemotherapy of avian malaria, E. K. MARSHALL, JR. (*Physiol. Rev.*, 22 (1942), No. 2, pp. 190-204).—Presented with a five-page list of references to the literature.

Studies on oxyuriasis.—XXVII, Notes on the survival of eggs of *Enterobius vermicularis* exposed to household fumigants, M. O. NOLAN and M. F. JONES (*Helminthol. Soc. Wash. Proc.*, 9 (1942), No. 1, pp. 23-25).—Fumigation experiments with hydrocyanic acid gas in a gas-tight vault in a storage warehouse indicate that, under conditions of the experiments, it fails to kill the embryos in the eggs of the pinworm *E. vermicularis*.

The beta phases of the genus Salmonella, with special reference to two undescribed *Salmonella* types, P. R. EDWARDS and D. W. BRUNER. (Ky. Expt. Sta.). (*Jour. Infect. Diseases*, 69 (1941), No. 3, pp. 220-223).—In studies of the beta phases of the *Salmonella* group they were shown to be divisible into five types. The antigenic characteristics of these types were delineated. Two new *Salmonella* types were described. *S. hartford* which was isolated from a case

of enteric disease in man, is represented by the formula VI VII: $y < - > e, n, x \dots$ *S. urbana*, which was found in a hog and a chicken, is represented by the formula XXX: $b \dots < - > e, n, x \dots$

Occurrence of *Salmonella typhimurium* infection in muskrats, W. H. ARMSTRONG (*Cornell Vet.*, 32 (1942), No. 1, pp. 87-89).—The autopsy and bacteriological findings in an outbreak of *S. typhimurium* infection in pen-raised muskrats are reported. The biochemical reactions are typical of *S. typhimurium*. The antigenic formula as determined by P. R. Edwards, of the Kentucky Experiment Station, is IV, V:1:1,2,3.

Stability of Vi antigen of *Salmonella typhi*, C. A. PELUFFO. (Ky. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 1, pp. 340-343).—The results obtained in the study reported show that Vi antigen of the typhoid bacillus is not affected by absolute alcohol and that its resistance to heat is much greater than was previously supposed. This stability to heat and alcohol is also shared by the Vi antigen of *S. paratyphi* C, *S. ballerup*, and certain strains of *Escherichia coli* in which F. Kauffmann² described V-W variation. The thermolability described by other investigators is accounted for by the fact that, in previous work, aqueous suspensions were used in the study of Vi antigen.

Variability in streptococci of group B, J. M. SHERMAN, E. C. GREISEN, and C. F. NIVEN, JR. (Cornell Univ.). (*Jour. Infect. Diseases*, 69 (1941), No. 3, pp. 271-277).—Evidence was obtained from experiments in which pure cultures were plated and thousands of reisolated daughter cultures studied, as well as from observations made intermittently over several years of stock cultures, which indicated true variability in streptococci of group B with respect to action on blood, lactose, and salicin. While rather convincing evidence of variation was furnished by some strains, a majority of the cultures studied proved to be remarkably stable, giving rise only to daughter strains having the same characteristics as the mother culture.

A study of the fibrinolytic properties of Lancefield's group C streptococci, L. F. WILLIAMS and C. S. BRYAN. (Mich. Expt. Sta.). (*Cornell Vet.*, 32 (1942), No. 1, pp. 43-48).—It was found in the work reported that bovine mastitis streptococci, including *Streptococcus agalactiae* and *S. uberis*, failed to lyse human, horse, rabbit, sheep, goat, ox, or chicken fibrin. "It would seem advisable to regard 'human' type group C cultures as those which attack human fibrin and to regard as 'animal' type group C those which attack either horse fibrin or neither human nor horse fibrin. It seems advisable to run fibrinolytic tests with human and horse fibrin to differentiate the types of Lancefield's group C streptococci. Horse fibrin was lysed by cultures of Lancefield's group C of the animal type only and not by group A or group G cultures. With the exception of determining the final pH in a 1 percent dextrose broth, biochemical reactions were of no help in separating those cultures which lysed human fibrin from those which lysed horse fibrin or those which lysed neither."

An additional growth factor needed by some hemolytic streptococci, A. BASS, S. BERKMAN, and F. SAUNDERS (*Jour. Infect. Diseases*, 68 (1941), No. 3, pp. 220-225).—The authors show that the addition of certain tissue extracts, or of yeast, supplies unknown substances needed by some β -hemolytic streptococci that fail to develop in the presence of the known growth factors which support ready growth of other strains of streptococci. Some sources of this unknown factor, or factors, together with some of its physical and chemical properties are reported. A procedure for preliminary purification is suggested.

Studies upon *Strongylus vulgaris*.—VI, Tests with organic copper salts, J. H. WHITLOCK. (Kans. Expt. Sta.). (*Jour. Parasitol.*, 28 (1942), No. 2, pp.

² *Aeta Pathol. et Microbiol. Scand.*, 18 (1941), No. 2, pp. 225-246.

168-169).—Further studies (E. S. R., 83, p. 244), here reported, reemphasize the existence of a marked secular variation in the reaction of *S. vulgaris* to a lethal agent. It is concluded that organic copper salts, unlike inorganic, need not be water soluble to be effective against a parasite either in vivo or in vitro. Copper formate, because of its markedly lethal action and because of its resistance to inactivation by sodium bicarbonate, should be tried as a substitute for copper sulfate in such diseases as haemonchosis of sheep.

The metabolism of trichinosis rats during the early phase of the disease, W. P. ROGERS (*Jour. Helminthol.*, 19 (1941), No. 3-4, pp. 87-104, figs. 16).

Further studies on trichomoniasis in birds, R. M. STABLER (*Auk*, 58 (1941), No. 4, pp. 558-562).—Results of the examination of a large series of various types of birds for the presence of *Trichomonas gallinae* are reported in this further work (E. S. R., 84, p. 822).

Vaccination against contagious abortion in calfhood: A review, E. M. ROBINSON (*Jour. So. African Vet. Med. Assoc.*, 12 (1941), No. 4, pp. 117-122).

Eristalis tenax genital myiasis in a cow, E. C. McCULLOUGH and J. E. MCCOY. (Wash. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 775, pp. 293-294, fig. 1).

The treatment of chronic bovine mastitis, O. W. SCHALK. (Univ. Calif.). (*Jour. Amer. Med. Assoc.*, 100 (1942), No. 781, pp. 323-334).—In experimental work on the eradication of *Streptococcus agalactiae* from the bovine mammary gland by the infusion or injection of entozon, trypanflavine, neutral acriflavine, tyrothricin, or novoxil, 750 mature cows in five dairy herds were used. Of these, 185 cows, with 345 infected quarters, were treated with one or more agents. Two hundred and eighty-eight quarters have been freed of infection. On an individual cow basis, 137 animals have been cured. The percentage of infected cows responding to udder injections of specific therapeutic agents varied with the five individual herds as follows: 53.1, 64.4, 91.9, 86.3, and 95.0 percent. The percentage of quarters cured by the various methods of treatment used in these trials was as follows: Acriflavine (1:10,000) 48.7, sugar-acriflavine 58.6, novoxil 73.5, tyrothricin 82.0, and entozon 90.0 percent. It is thought that the treatment of the dry udder with either novoxil or tyrothricin may prove to be the most practical means for eradication of this organism from dairy herds. Infections with *S. uberis* or *S. dysgalactiae* responded to treatment at least as well as those caused by *S. agalactiae*. On the other hand staphylococcal infections were comparatively resistant to chemotherapy.

Isolation and characteristics of bacteriophages for staphylococci of bovine mastitis, L. W. SLANETZ and E. JAWETZ (*New Hampshire Sta. Sci. Contrib.* 80 (1941), pp. 447-455).—Previously noted (E. S. R., 85, p. 400).

Clinical observations on use of gramicidin in the treatment of bovine mastitis, L. H. TRIPP and C. A. LAWRENCE (*Cornell Vet.*, 32 (1942), No. 1, pp. 90-95).—Evidence is presented which indicates that gramicidin, one of the purified fractions of tyrothricin, is an effective chemotherapeutic agent in the treatment of bovine mastitis caused by *Streptococcus agalactiae*. Of 20 cows treated with a gramicidin-oil emulsion in the field of regular veterinary practice, 15 of the animals were returned to usefulness. One additional recovery was brought about by the use of sodium sulfathiazole.

Isolation of glutathione and thionine from the blood of selenized steers, H. D. ANDERSON and A. L. MOXON. (S. Dak. Expt. Sta.). (*S. Dak. Acad. Sci. Proc.*, 21 (1941), pp. 16-18).

[Prevention of calf losses at the Bltmore Farms, Asheville, N. C.] (*Jersey Bul.*, 61 (1942), No 16, pp. 529, 538, figs. 3).—A description is given of

the method of sanitation employed in preventing the high calf mortality that previously occurred, including a cross section of the brooder devised.

Treatment of infectious diarrhea (white scours) with sulfaguanidine (*South Carolina Sta. Rpt. 1941, pp. 88-89*).—Reference is made to work by G. H. Wise and G. W. Anderson in which promising results have been obtained from the use of sulfaguanidine in the treatment of a limited number of cases of calf diarrhea, definitely diagnosed as white scours.

Sulfaguanidine therapy for calf scours, W. T. S. THORP and J. F. SHIGLEY. (Pa. Expt. Sta.). (*Vet. Med., 37 (1942), No. 5, pp. 210-213, figs. 3*).—Of 40 calves suffering from typical calf scours that were treated with sulfaguanidine 1 succumbed and the remainder made a fair to very good recovery. The treated calves did not appear to lose their appetite or suffer from the disease to the extent that calves receiving other forms of treatment did.

Streptococcus agalactiae in the udders of heifers at parturition traced to sucking among calves, O. W. SCHALM. (Univ. Calif.). (*Cornell Vet., 32 (1942), No. 1, pp. 49-60*).—It is concluded from a study of certain herds, a small percentage of the heifers of which were observed to freshen with their udders infected with *S. agalactiae*, that this organism may be transferred to the udders of calves by sucking among pen mates fed on infected milk, and that the streptococci may persist there until first parturition and then be shed in the milk.

A preliminary note on the length of life of the stomach worm Haemonchus contortus in the calf, R. L. MAYHEW. (La. State Univ.). (*Helminthol. Soc. Wash. Proc., 9 (1942), No. 1, p. 28*).—In the experiment conducted a calf inoculated with infective larvae of *H. contortus* was kept under conditions described by the author in an earlier contribution (E. S. R., 82, p. 537). In daily fecal examinations continued to the end of the experiment there was a gradual decrease to a very low count by the end of the fourteenth month. No negative examinations were obtained, but counts as low as 0.02, 0.03, and 0.08 eggs per gram of sediment were obtained toward the end of the experiment. Eggs were recovered for a period of 14 mo. and 15 days.

Experimental production of coccidiosis in silage-fed feeder lambs, with observations on oöcyst discharge, J. F. CHRISTENSEN. (U. S. D. A.). (*North Amer. Vet., 22 (1941), No. 10, pp. 606-610*).—A study made during the fall of 1939 of a severe outbreak of coccidiosis in lambs confined to the feed lots of a large feeding establishment in central Nebraska is reported. The details of coccidial dysentery and oöcyst production in experimentally and naturally infected feeder lambs fed corn silage exclusively are reported in table form. It is concluded that the significant quantitative differences noted between the experimentally and naturally infected groups of lambs in incidence of diarrhea, severity of symptoms of coccidiosis, and volume of oöcyst production can be attributed only to the relatively greater inoculum of infective oöcysts consumed by the experimentally infected lambs during the first 2 days of the experiment. Obvious similarities between the two groups in time of development of clinical coccidiosis and periods of greatest oöcyst output of the predominant species of coccidia suggests that the clinical infection in the naturally infected lambs likewise developed from oöcysts ingested during the first few days of feeding. This experiment appears to indicate, therefore, that the severity of the outbreaks of coccidiosis in these small groups of equally susceptible feeder lambs was roughly proportional to the numbers of viable, sporulated oöcysts ingested during the early part of the feeding period prior to the development of the clinical symptoms of the disease. It is considered to show conclusively that the addition of viable, sporulated oöcysts to the feed of highly susceptible feeder lambs

may increase the incidence and severity of the resulting clinical coccidiosis. It does not necessarily disprove the theoretical possibility suggested that feed lot coccidiosis may develop without outside source of infection, following the action of certain predisposing environmental factors which cause increased susceptibility to the attacks of coccidial parasites already harbored by the feeder animals. However, experimental evidence in support of this possibility appears to be lacking.

Ovine listerellosis: Report of an outbreak in a purebred flock, G. W. JENSEN and W. J. GAY (*North Amer. Vet.*, 22 (1941), No. 10, pp. 601-605, figs. 4).—Report is made of an outbreak which took place in (1) a flock of about 300 purebred native sheep of various breeds attended by the authors after 15 animals had succumbed, at which time 6 were visibly sick, and (2) a group of yearling ewes and rams. The symptoms, results of post-mortem examinations, treatment, and prophylactic treatment of five and two lots, respectively, are considered.

The efficiency of phenothiazine against *Nematodirus* spp. in sheep, G. P. KAUZAL (*Jour. Council Sci. and Indus. Res. [Austral.]*, 14 (1941), No. 4, pp. 301-303).—In experimental work phenothiazine in a single dose of 0.6 gr. per kilogram of body weight was highly effective as an anthelmintic against *Nematodirus* in sheep. Some residual infestation remained, but this was reduced still further by a second dose of 1.2 gr. of phenothiazine per kilogram of body weight. A new device was used to detect fluctuations in fecal egg counts when the number of eggs per gram of feces is low.

The effect of phenothiazine on the weights of worm-free sheep and goats, J. W. G. LEIPER and B. G. PETERS (*Jour. Helminthol.*, 19 (1941), No. 3-4, pp. 71-74).—The administration of a dose of 30 gm. of phenothiazine, 15 gm. being given as tablets in one dose followed by three doses of 5 gm. each, to three goats and six sheep known to be worm-free had no effect on their weights in comparison with equal numbers of worm-free controls during a period of 15 weeks from administration of the first dose. This led to the conclusion that weights can validly be used as a criterion of anthelmintic efficacy. They not only constitute an obvious economic criterion but also are statistically more sensitive than egg counts when subjected to analysis of covariance.

Effectiveness of a method of raising experimental pigs free from worm parasites, L. A. SPINDLER (U. S. D. A.). (*Helminthol. Soc. Wash. Proc.*, 9 (1942), No. 1, pp. 22-23).—This contribution supplements that previously noted (E. S. R., 69, p. 432). Description is given of a type of farrowing house and a method of handling the sows and litters that proved generally effective in preventing extraneous infections of the suckling pigs with worm parasites and coccidia. The method involves thorough cleaning and washing of pens to eliminate the majority of eggs passed in the feces of the sows. This is followed by a period of drying to destroy any of the organisms that may have escaped the cleaning and washing processes.

Field investigations on sulfaguanidine in swine enteritis, H. S. CAMERON (Univ. Calif.). (*Cornell Vet.*, 32 (1942), No. 1, pp. 1-10).—Field work in three herds in which sulfaguanidine was used has led to the conclusion that *Salmonella suispestifer*, while of importance as an etiological agent of swine enteritis, is probably secondary to other more obscure factors such as a nutritional deficiency. It is pointed out that access to an unlimited amount of feed, with resultant overeating, plays a role in the etiology, particularly in weaner pigs. In the treatment of swine enteritis lowering the food intake has been one of the essentials and undoubtedly has a distinct influence on the termination of the outbreak in a herd. However, it is usually insufficient treatment for the sick animal

and should be accompanied by a therapeutic agent. The results obtained from its administration in the work here reported indicate that sulfaguanidine has a place in the chemotherapy of swine enteritis. Its bacteriostatic action, low absorption rate, and consequent tolerance by the animal render it a suitable therapeutic agent in enteric infections. The results also indicate that it may be given at the rate of 1 gm. per 20 lb. of body weight four times daily for 5 days and in severe cases increased to 2 gm. per 20 lb. of body weight without the appearance of toxic symptoms.

Immunological studies with hog cholera tissue vaccine, W. H. BOYNTON, G. M. WOODS, F. W. WOOD, and N. H. CASSELBERRY (*Vet. Med.*, 37 (1942), No. 5, pp. 214-216).—In experiments on the duration of immunity following the use of a single dose of tissue vaccine, here reported, pigs that were observed over a period up to 4 mo. after receiving a single 10-cc. dose and those that were observed up to 6 mo. after receiving a single 5-cc. dose were protected satisfactorily against cholera infection. No detectable difference in the degree of immunity was shown between pigs receiving the 5-cc. and 10-cc. dosage. Experiments conducted in the field have shown that pigs receiving a single 5-cc. injection of tissue vaccine were protected for periods up to 202 days. Experimental trials with the intracutaneous injection of tissue vaccine indicate that susceptible pigs may be immunized against hog cholera by this method, but they are as yet insufficient to warrant any definite conclusions. Experimental results following the simultaneous injection of anti-hog-cholera serum and tissue vaccine seem to show that some active immunity may be expected from this treatment. The results reported here further demonstrate the adequacy and safety of tissue vaccine as an immunizing agent against hog cholera and as an agent which can be used without fear of aggravating intercurrent infections or spreading hog cholera infection.

The influence of arsenic on selenium poisoning in hogs, A. L. MOXON. (S. Dak. Expt. Sta.). (*S. Dak. Acad. Sci. Proc.*, 21 (1941), pp. 34-36).—Experimental findings have shown that arsenic as Na_2HAsO_3 when fed at the rate of 5 p. p. m. in the drinking water for pigs will counteract the toxicity of selenium when fed at the rate of 9 p. p. m., the amount of selenium contained in feeds on many farms in seleniferous areas. A study of the selenium and arsenic content of tissues conducted indicates that the arsenic prevents at least a part of the selenium from entering the muscle tissues of the hog. The liver of the pig fed both selenium and arsenic contained more selenium than the liver of the pig fed selenium without the arsenic. This observation is in line with the results obtained by feeding dogs selenium with and without arsenic. The theory that some of the selenium in the liver is bound there by the arsenic in a nontoxic form when selenium and arsenic are fed together is advanced.

Influence of ultraviolet light on equine encephalomyelitis virus protein (eastern strain), A. R. TAYLOR, D. G. SHARP, D. BEARD, H. FINKELSTEIN, and J. W. BEARD (*Jour. Infect. Diseases*, 69 (1941), No. 3, pp. 224-231, figs. 10).—In the study reported measurements were made of the extinction coefficient of solutions of purified equine encephalomyelitis virus protein for wave lengths between 2,200 and 3,000 a.u. The absorption spectrum shows a pronounced peak in the neighborhood of 2,600 a. u., a broad minimum at about 2,450 a. u., and increased absorption toward complete extinction at 2,200 a. u. Qualitatively the absorption curve was similar to that of nucleic acid, of which the virus protein contains only 4.4 percent. No quantitative relation was evident, since solutions containing pure nucleic acid in concentrations comparable to that of the intact virus protein gave much smaller values for the extinction coefficient. A quantitative study of the rate of inactivation of infectivity associated with the pro-

tein by monochromatic light of 2,537 a. u. revealed a linear relation between the log of the survival ratio and time of irradiation for dilute solutions, indicating a primary photochemical inactivation. With protein concentrations of 0.20 mg. per cubic centimeter the rate of inactivation decreased with time and the relation deviated from linearity. Paralleling the decrease in rate of inactivation was an increase in light absorption with time of irradiation. The decrease in the rate of inactivation with irradiation of the more concentrated solutions has been considered as due at least in part to the increase in absorption. Inactivation of infectivity did not affect the sedimentation pattern or constant of the protein. The rate of inactivation of infectivity by light of 2,537 a. u. is of the same order of magnitude as that for the bacterium *Salmonella marcescens* under similar conditions.

Canine encephalomyelitis, D. R. CORDY (*Cornell Vet.*, 32 (1942), No. 1, pp. 11-28, figs. 6).—The results of a study of a disseminated encephalomyelitis of mature dogs, which may be a new disease entity, are reported.

Recent studies of poultry disease at the University of California. (Univ. Calif. et al.). (*Nulaid News*, 19 (1942), No. 11, pp. 26-27, 54-55).—The progress of recent work with poultry diseases at the California Experiment Station is summarized. Tests made of the value of sulfaguanidine in the treatment of cecal coccidiosis indicate that it may be of practical use for control of outbreaks on poultry farms. Negative results were obtained from tests of several drugs and methods of administration in the treatment of infectious coryza.

An investigation by D. Stover of the nervous disorder of chicks, first observed in 1940 by Beach (*E. S. R.*, 84, p. 821) has revealed as the cause a filtrable virus distinct from others which infect chickens. "The virus has been demonstrated in the blood, lungs, air sac membranes, and also, but apparently to a lesser extent, in the brain of acute active cases. The disease has been transmitted by injection of blood and suspensions of air sac and lung tissue into the breast muscle, beneath the skin, into the nasal passages of trachea and brain, and by contact. Chickens which survived inoculation have been resistant to a second inoculation. In nearly all outbreaks a respiratory disease resembling infectious bronchitis of chicks has appeared first and has been followed by symptoms of central nervous system disturbance in a variable number of the birds in the flocks. The same has been true of the majority of experimentally infected chicks, although several have developed nervous symptoms and died without showing visible evidence of involvement of the respiratory organs. Chicks ranging in age from a few days to 70 days have been equally susceptible. Tests for susceptibility of older chickens have been limited to a group of six 100-day-old males, one of which became visibly infected, and three mature hens, none of which developed symptoms. The present evidence indicates that the respiratory disease is distinct from infectious bronchitis, laryngotracheitis, and other known respiratory infections of chickens." It would appear therefore that it is a new type of respiratory infection which is accompanied by involvement of the central nervous system in a variable number of the infected chickens. To differentiate it from other diseases, the name respiratory-nervous disease has been tentatively adopted. Attempts to cultivate the virus on chick embryos are giving encouraging results.

Reference is made to the 3 yr. of work with hexamitiasis of the turkey which have definitely shown the protozoan *Hexamita meleagridis* to be the cause. Other work with turkey diseases noted relates to pullorum disease, paratyphoid, and vaccination for fowl pox.

Studies on hexamitiasis in the chicken and turkey, J. B. TRAINOR (*Wash. Univ. [Seattle] Pubs., Theses Ser.*, 6 (1942), pp. 201-202).—A study made of 32

turkey flocks in western Washington comprising a total of 70,585 birds revealed the presence of coccidiosis and blackhead in more than half of the flocks and pullorum disease and ricketts in about one-quarter, with 16 other diseases present in from 4 to 18 percent of the flocks. One-sixth of the flocks reported showed the pertinent symptoms of hexamitiasis. Tables are given to show the mortality occurring in the two types of flocks at different portions of the growing season. In both types mortality is heaviest in the first 10 weeks. The total mortality in flocks retaining old birds is 11.73 percent while that for flocks with only new birds each year is 9.42 percent.

In an attempt made to cultivate *Hexamita* originating in chickens in Locke's egg albumin medium it was found that the trophozoites rapidly disappeared from the medium at 97° and 102° F., whereas *Trichomonas*, present as a contaminant, survived two transplants made at 4-day intervals before disappearing. After storage in the refrigerator for several days, two such cultures were combined and introduced per os into 2 birds to see if any viable cysts were present. Those cultures were then combined with a third culture which was thought to contain originally only *Hexamita*. This mixture was inoculated per os and per rectum into 1 of the 2 birds previously inoculated.

It is concluded that *Hexamita* is not susceptible of cultivation in Locke's egg albumin medium, but that the organism will persist as a viable cyst over relatively long periods of time in it.

It is concluded from transmission experiments that *Hexamita* of rat origin is transmissible to, infective, and pathogenic for the young turkey poult, and that rat control in the vicinity of turkey ranches is a preventive measure; further, that the effect of hexamitiasis of rat origin in the older turkey poult is similar to that occurring in naturally infected cases. No *Giardia* were recovered from any of the infected cases, indicating that this parasite was unable to adapt itself to the physiology of the avian host.

The differential leucocyte picture for the control and experimental animals is given, together with a record of normal temperature fluctuations for turkey poults.

Infectious catarrhal enteritis of turkeys: Transmission and prevention, W. R. HINSHAW and E. McNEIL. (Univ. Calif.). (*Jour. Amer. Vet. Med. Assoc.*, 100 (1942), No. 781, pp. 361-362).—Investigations have shown definitely that the two species of *Trichomonas* found in the lower intestinal tract of turkeys are not pathogenic, and that the term trichomoniasis should not be applied to this affection in that fowl. *Hexamita meleagridis* is the causative agent.

Fever therapy in the control of cecal and liver trichomoniasis in turkeys, M. W. OLSEN and E. A. ALLEN. (U. S. D. A.). (*Poultry Sci.*, 21 (1942), No. 2, pp. 120-127, figs. 4).—In this study of turkeys conducted at the Beltsville (Md.) Research Center, it was found that the type of *Trichomonas gallinarum* present in the flock can be successfully treated by the application of fever therapy. In this form of trichomoniasis, the liver and ceca were found involved, showing characteristic lesions which closely resemble those produced by the organism *Histomonas meleagridis* in the disease commonly known as blackhead. In these investigations, 60 crossbred turkeys ranging from 3 to 18 mo. of age were treated, of which 54 were naturally and experimentally infected. Each bird was given from three to six treatments of from 1 to 2 hr. at intervals of 2 days. The fever was induced by placing the birds within an air-conditioned cabinet in which the air temperature was maintained at from 104° to 106° F. and the relative humidity at approximately 50 percent. In this environment the body temperature of the turkey rises from the normal of 106.5° to approximately 111° to 112°. Fifty of the 60 infected birds, or 83.3 percent, that received the

fever therapy recovered. Subsequent records of the treated birds showed that growth, fertility, and hatchability were not affected by the induced fever or previous diseased condition. Sixty-two infected turkeys (54 naturally, 8 experimentally) of the same age and quality as those which were treated served as controls, only 19, or 30.6 percent, recovering from trichomoniasis.

Salmonella-infecties bij duiven in Nederlandsch Indie [*Salmonella infections of pigeons in the Dutch East Indies*], F. C. KRANEVELD, M. ERBER, and M. MANSJOER (*Nederland. Indische Bl. Diergeneesk.*, 53 (1941), No. 6, pp. 410-435; *Eng. abs.*, p. 427).—*Salmonella* infections were found to be present in 8 of 13 flocks of pigeons to the extent of from 14.6 to 64 percent of the birds examined. Both in young and adult pigeons acute fatal cases of disease were observed, and clinically healthy infection carriers (on the genitalia) were recognized. Among the old birds, moreover, cases of chronically progressing conditions (cachexia) were noted. *S. typhimurium* (8 X), *S. typhimurium copenhagen* (88 X), and *S. dublin* (2 X) were isolated. The two first-mentioned strains were also isolated from eggs.

The use of pigeon pox vaccine, F. R. BEAUDETTE (*New Jersey Stas. Hints to Poultrymen*, 29 (1941-42), No. 2, pp. [4]).—Following a brief discussion of the types of viruses that cause fowl, turkey, pigeon, and canary pox, respectively, the value of the pigeon pox virus as a vaccine to be used to protect laying flocks and flocks of chickens known to carry blackhead or similar infections, under which conditions the fowl pox virus vaccine cannot be applied, is pointed out. Since the immunity in the chicken created by pigeon vaccine is in proportion to the size of the vaccination lesion, it should be applied only by the feather follicle method and never by the "stick" method. It is recommended that an area about $\frac{3}{4} \times 2$ in. be plucked and inoculated. Such an area contains about 50 feather follicles. Although there is no upper age limit, the lower limit is governed largely by the degree of feathering. Since pigeon virus has a particular affinity for follicular cells the birds should be well feathered. Particular attention should be given to the amount of virus used. In the author's experiments 80 mg. of dried virus were suspended in 4 cc. of diluent in order to vaccinate 100 birds. Commercial vaccines vary widely in the amount of virus supplied for 100 vaccinations. A table is given which shows the amounts of virus and diluent supplied by each of eight laboratories for 100 vaccinations.

A description is given of the technic employed in the vaccination. When vaccinating after an outbreak has started, affected chickens should be isolated so that they cannot serve as a source of infection to vaccinated birds, in which immunity is not developed until 4 weeks have elapsed. Vaccination of affected chickens is of no value whatsoever. Since pigeon virus is a modified one it cannot produce as strong an immunity in the chicken as fowl pox, and for this reason properly vaccinated flocks sometimes become infected with fowl pox, but these cases are usually not serious and often have little effect on production. On the other hand, when pigeon pox is used on pigeons it produces a solid immunity because the virus in relation to the pigeon is the same as the fowl virus is to the fowl. Hence in vaccinating pigeons only three or four follicles should be infected. In the turkey, even the fowl virus does not produce a durable immunity, and it may be surmised that the pigeon virus would produce even less immunity against the turkey strain of pox.

AGRICULTURAL ENGINEERING

Agricultural engineering in national defense, S. P. LYLE (U. S. D. A.). (*Agr. Engin.*, 22 (1941), No. 8, pp. 277-280, fig. 1).—This is a general discussion of the situation as of June 1941.

Presentation of results of

S. D. A.).

(*Agr. Engin.*, 22 (1941), No. 8, pp. 295-296).—The author defines a critical experiment as one so designed that it will yield not only the differences between plots or individuals treated differently but also an estimate of the difference between those treated alike, by which the significance of the former may be judged. The observed results of a critical experiment, especially if it be a complex experiment, are not very intelligible to a person not trained in modern statistics, and the statistical analysis by means of which the results are presented frequently gives but slight aid in making them clear. The author analyzes a typical complex critical experiment as an illustration of what is required in presenting the results so that they show the effects of the treatments involved both singly and in combination.

[**Agricultural engineering investigations by the New Jersey Stations**] (*New Jersey Stat. Rpt. 1941*, pp. 17-18, 20, 69-70, 83-85, 111-113, [pls. 2]).—Current experimental results are reported in the form of brief answers to the following questions: Does silo leakage waste food material and what can be done about it, what determines silo pressures, are separate silo reinforcing schedules recommended for corn and grass silage, will silos hold more grass than corn silage, can condensation loading of dairy barn insulation be prevented, does it pay to irrigate potatoes in New Jersey, what is the New Jersey trend in crop irrigation, does tiling justify its cost and what system is recommended, how does New Jersey rank in rural electrification, what does the U. S. D. A. Extension Service offer those having farm building problems, what paint types are best for farm structures in New Jersey, is assistance available in the adaptation or development of new machinery applications to farming, what is the cause of red water from wells and how can it be corrected, can polluted water be effectively sterilized by ultraviolet rays and made suitable for potable purposes, does the process of chemical treatment of sewage produce a sludge containing more plant nutrients than sludges from other processes, can the ash obtained from sewage sludge incinerators be used for commercial purposes, what are the sources of odor in sewage treatment processes, how can the odors produced by stale sewage be controlled, can grease removal from sewage be accelerated, is chlorine effective in the control of bulking of activated sludge, can the oxidation of carbonaceous and nitrogenous materials in sewage proceed simultaneously, and how can the operation of an activated sludge plant be better controlled.

[**Agricultural engineering investigations by the South Carolina Station**] (*South Carolina Sta. Rpt. 1941*, pp. 22-24, 173, fig. 1).—G. H. Dunkelberg, G. B. Nutt, H. T. Polk, and A. R. Reed recorded data on corrosion of fencing materials on posts treated with copper sulfate and zinc chloride, and on the staples and wire, and on polished v. coated staples, and O. B. Garrison on flue-heated hotbeds for sweetpotatoes.

[**Agricultural engineering investigations by the Tennessee Station**] (*Tennessee Sta. Rpt. 1940*, pp. 17-18).—M. A. Sharp reports upon a legume-seed scarifier, lime and fertilizer spreader, legume silage experiments, and a milk pasteurizer. Work on erosivity and infiltration capacity of soils, including tests of a rotary nozzle and accessory apparatus, is noted by A. L. Kennedy.

[**Agricultural engineering investigations by the Washington Station**] (Partly coop. U. S. D. A.). (*Washington Sta. Bul. 410* (1941), pp. 10-12, 40).—L. J. Smith reports upon apple juicers, winter lighting of flowering plants and poultry, pig and lamb brooders, all-electric greenhouse, wet cooling of dressed poultry, and light trap investigations for codling moth control. A note on the effects of the type of construction on the losses and nutritive value of stack silage, by F. B. Wolberg and J. C. Knott, is also given.

Duty-of-water investigations (New Mexico Sta.)

Data are noted from studies with alfalfa and cotton.

Hydrologic evaluation of watershed improvement programs, R. L. STEVENS and E. R. KINNEAR. (U. S. D. A., *Engin.*, 23 (1942), No. 4, pp. 136-137, [figs. 8].)—The authors illustrate the step-by-step procedure developed for hydrologic evaluation in determining the effect of an agricultural program on flood flows on a small watershed where the limiting factor is the capacity of the soil surface to infiltrate rainfall and where flood events are not complicated by snow melt. For watersheds with conditions other than these, many of the individual steps are similar, but the evaluation methods vary due to the conditions encountered. They are now able to show by defensible methods that the effect of improved land use and practices on reducing flood flows is significant. This effect varies for different areas and watersheds with physical characteristics, climate, and economic limitations of land operators. Some of the typical variables encountered are geographic location, magnitude of floods, and the seasonal occurrence of floods. The estimates of the effect of proposed programs on flood flow reduction are believed reasonable, however.

Controlling erosion in farm drainageways, C. C. RICKER ET AL. (*Agr. Engin.*, 23 (1942), No. 4, pp. 136-137).—This is a committee report on control measures, discussing briefly such topics as seeding of farm drainageways; mulching; sodding; structures; location, size, and shape; soil; limits of use of vegetation; types of vegetation; and methods of establishing and maintaining it.

Controlled drainage in the northern Everglades of Florida, B. S. CLAYTON and L. A. JONES. (U. S. D. A.). (*Agr. Engin.*, 22 (1941), No. 8, pp. 287-288, 291).—Low pumping lifts and low cost of reclamation in the peat lands of the northern Everglades permit good water control at very reasonable cost. A well-designed system is the first essential, however, and a second is proper maintenance of ditches, levees, and pumps. The pumps should then be operated with sufficient continuity to maintain a near-constant water level in the pump canal, a water table at about 1.5 ft. having proved desirable for many truck crops. A well-designed and operated drainage system may save sufficient crop loss to pay for itself in a single season. The top portion of the soil which is kept pulverized by cultivation may become unduly dry during periods of little rainfall, and additional moisture may be needed at time of planting. At such times additional moisture can be supplied by raising the water table by use of the pumps.

Hydraulic studies of conservation structures at the outdoor Hydraulic Laboratory, Spartanburg, South Carolina (U. S. Dept. Agr., Soil Conserv. Serv., and South Carolina Sta., [1942], pp. [2]+18, [figs. 30]).—This publication presents a general description, accompanied by numerous photographs, of equipment built and experiments carried out to test small experimental erosion control dams and waterways. Among the structures described and shown are an impounding reservoir capable of a maximum flow of 35 cu. ft. per second for about 1.5 hr. with a lowering of the water level not greater than 1 ft.; a Bermuda grass sodded canal used to carry the water supply and built to follow the contour of the hillside; a model testing basin which provided a facility for testing conservation structures, including gully control structures, check dams, and farm pond spillways; experimental meadow strip waterways planted to various types of vegetation used to resist scouring and gullying; channels for testing the relative merits of various types of channel lining vegetation; and gaging equipment, measuring flumes, and other experimental set-up. Experiments illustrated include a notch test for the determination of the capacities of rectangular openings; tests of various channel linings, as Bermuda

grass, centipede grass, kudzu vine, and a cotton-reinforced asphalt lining; etc. The results are stated in terms of qualitative comparisons among channel linings and meadow strip cover, etc. Constructional detail is not dealt with, and no drawings are reproduced. It is noted that the Spartanburg work has been discontinued and similar work set up at Stillwater, Okla.

A study of old farmer-built terraces, A. CARNES and W. A. WELD. (U. S. D. A.). (*Agr. Engin.*, 22 (1941), No. 10, pp. 361-362, 366, fig. 1).—The purpose of this study was to obtain factual data relative to the technical quality and effectiveness of old farm-built terraces in the Southeast. A total of 524 terraced fields, comprising 14,257 acres, were included, on 86 percent of which the water-disposal systems were improperly planned. The following conditions were found on these fields: Improper location of outlets, 63 percent; excessive terrace gradient, 57; water carried across natural draws, 49; terraces too long, 36; and headwater drainage not diverted, 22 percent. Terrace channel capacity was found to be below accepted standards on 83 percent of all fields studied. Terrace maintenance was inadequate on 83 percent of the fields, which apparently accounts in large measure for the preceding failure. In 92 percent of all cases the terraces were used as guides for row lay-out, indicating attempt to obtain contour cultivation. More than 50 percent of the row grades appeared excessive, however. Crop rotations (usually 2-yr.) were practiced on 34 percent of the fields studied, continuous row crops on the remaining 66 percent. Unprotected critical areas were found to be contributing to terrace failures on 43 percent of all fields studied. Terrace channel scouring was indicated on 57 percent of the improperly planned fields, and a similar percentage of fields in that group had terrace gradients exceeding 6 in. per 100 ft. Other causes of the improper performance of terraces were terraces overtopping, 60 percent; terrace outlets not stabilized, 75; terrace channel obstructed, 27; and outlet end of terraces restricted, 24 percent.

For those fields, comprising 14 percent of the total, upon which the water-disposal systems were properly planned, corrective measures may be initiated to adjust the systems so that they will meet accepted standards. Generally, the fields in this group were smaller and required less difficult planning than larger fields.

Plowing terraced land, E. G. JOHNSON (U. S. Dept. Agr. Leaflet 214 (1942), pp. [2]+6, figs. 6).—The following recommendations are briefly discussed and illustrated by photographs: Plow on the contour, repair terraces before plowing, vary method of plowing the area between terraces, and plant and cultivate parallel to terraces.

Some important farm machinery and soil conservation relationships, M. L. NICHOLS and R. B. GRAY. (U. S. D. A.). (*Agr. Engin.*, 22 (1941), No. 10, pp. 341-343, figs. 3).—The author notes the numerous varieties and sizes of terrace construction and maintenance equipment now on the market and the increased number of operators skillful in their use. Development of contour furrowing knowledge and practice has been slower, but recent progress has been substantial. Conditions suitable for the use of the basin lister are still under discussion, but this implement should be used under some crop and climatic conditions. Contouring is the most extensive water conservation practice but still involves such machine problems as prevention of side slippage and the proper guiding of implements on the steeper lands. Subsurface tillage, leaving the residues on the surface, with such devices as the subsurface blade, rod weeder, specially designed sweeps, etc., requires research to perfect these practices with many crops and under many conditions before their general use can be advocated. Subsurface tillage is considered to offer much promise as a

means for soil and water conservation, however, and a considerable part of this discussion is given to it and to the new engineering problems created.

Constant-current resistance soil pasteurizer, S. R. CRUZ (*Agr. Engin.*, 23 (1942), No. 4, pp. 129-130, 133, figs. 6).—The author outlines the construction of a set-up for experimental heating of soil by its own electric resistance. Since the resistance of soils drops with rise of temperature, it was necessary to use a constant-current transformer of the street-lighting type. The pasteurizer discussed and illustrated in diagrammatic drawings is described as a miniature wooden silo 2 ft. in diameter and 20 in. high; at top and bottom were parallel horizontal electrodes of 20-gage galvanized-iron sheet, the top one being under a ribbed cover arranged to be tightened down onto the soil by four bolts. It was found possible to pasteurize sandy loam with a moisture content as low as 6.08 percent, sand at 6.45 (without electrolyte), and muck at 44.4 percent. Because of the decrease in moisture content, the kilowatt-hours per cubic foot necessary to raise the temperature of the soil 50° C. were reduced very markedly as compared to those reported by many other workers—0.72 for sandy loam, 0.808 for sand, and 0.705 for muck. The power demand was variable, but the maximum did not exceed the 2-kw. rating of the transformer. The mechanical condition of the soil pasteurized at low moisture content was much improved and handling was facilitated. Drying up of the electrode contacts at low moisture contents was effectively prevented by placing a thin layer of comparatively wet soil immediately in contact with the electrodes. Temperature distribution was not exactly uniform but vastly superior to that of the hot-pipe pasteurizers. In order to obtain the highest efficiency with this system of pasteurizing soil, it is necessary that there shall be the correct relationship between the type of soil, its moisture content, the diameter of pasteurizer, the soil depth, and the performance characteristics of the particular transformer in question. If the transformer characteristics are known, it is possible to determine by computation from the data secured in this investigation all the necessary facts.

Engineering aspects of rodent control, F. E. GARLOUGH (*Agr. Engin.*, 22 (1941), No. 8, pp. 285-286, 291, figs. 5).—Besides showing foundation, wall, and floor construction for excluding rats, the author points out that burrowing field rodents may become an engineer's problem both by forming near the soil surface burrows which collapse to start gully erosion and by causing leakage or breakdown of the walls of irrigation ditches. Specifically mentioned are pocket gophers, ground squirrels, prairie dogs, and muskrats. Damage caused by beaver dams is also noted, with the suggestion that this situation can be corrected by live-trapping the beavers and transferring them to a location at a higher altitude along a stream where dam building will be a benefit by helping to hold back the water and prevent a rapid run-off.

Overshot and current water wheels: Design, construction, and installation for small power developments on ranch and farm, O. W. MONSON and A. J. HILL (*Montana Sta. Bul.* 398 (1942), pp. 30, figs. 16).—For both overshot and current wheels, general design is shown in drawings and discussed in detail sufficient to permit the builder to design and make the wheel in dimensions determined from local conditions and requirements. Parts are defined and indicated in the drawings, and their respective functions and essential characteristics are pointed out. For the overshot wheel, both a metal hub wheel otherwise of all wood construction and an all-metal construction are dealt with, together with wheel mountings, delivery chute with control gate, tail race, wheel shelter, power drive, etc. For the current wheel, only all-wood construction is recommended and

described, with raft mounting, mounting in a flume, lifting mechanisms, and related details.

Results of a drilled corn experiment, L. J. PFISTER (*Agr. Engin.*, 23 (1942), No. 4, p. 134, fig. 1).—The author reports an experiment carried out in the seasons of 1939, 1940, and 1941 to compare production costs in the standard method in checkrowed fields with gasoline-powered tractor equipment and regular shovel cultivation with those of the drill method. In the drilled field all field work, except harvesting, was done with a Diesel tractor, and there was no cultivation with a shovel cultivator. Furrow openers were used in the 1939 season, but under the level field conditions there seemed to be no advantage in this method and it was discontinued in 1940 and 1941.

Higher yields resulted each year from the closer row spacing. The ideal spacing appeared to be about 20 in. in each direction. The best spacing gave thicker stand, avoided disturbance of the root system by cultivation, and permitted greater efficiency in harvesting.

Machinery for harvesting bluegrass seed, J. B. KELLEY. (Univ. Ky.). (*Agr. Engin.*, 22 (1941), No. 10, pp. 353-354, figs. 4).—The author describes a hand stripper capable of a maximum harvesting of $\frac{1}{2}$ acre per day and no longer in use for production scale harvesting; two types of horse-drawn comb stripper requiring two men for their operation, one driving and the other operating a short cutting knife; a revolving comb stripper covering from 6 to 7 acres per day when horse drawn; an all-steel revolving comb stripper capable of harvesting, when tractor drawn, from 15 to 18 acres per day; and two forms of a recently designed seed header having some of the features of the small-grain combine. One of these machines was provided with a cutter bar 10 ft. long, the other with a 14-ft. bar. The machines were pulled by a tractor equipped with a power take-off to operate the knife, reel, and conveyor belts of the harvester. The 10-ft. machine was operated at an average speed of 5.5 miles per hour and the larger one at 4.75 m. p. h. The smaller machine harvested on an average 800 bu. of rough seed per 12-hr. day during 1940, or 45 acres per day. The seed header was found to have the advantages over the implements previously used in that less seed is lost in the field; the machine does not have to be stopped to change sacks; the seed cures more readily in the curing ricks, with less labor required for turning to prevent the danger of heating; and seed germinates better. It was, however, very difficult to separate the seed from the stems and chaff with the present types of cleaning equipment. The cutter bar and slat reel were discarded and replaced by a revolving cylinder or beater 10 ft. in length, 17.5 in. over-all diameter, and made of pressed steel disks to which are fastened wooden bars to make a solid drum. Into this were driven 20-penny spikes to serve as beater teeth. The teeth are 2.5 in. long and were placed spirally around the drum in sufficient number so that, as the drum revolves in the grass, the seed is beaten from the stems and thrown back on the conveyor platform. Power is furnished through a power take-off from a tractor. The green seed harvested by this machine leaves less straw to be handled.

Curing equipment and cleaning and grading are also dealt with briefly.

Compression of cotton at cotton gins, C. A. BENNETT. (U. S. D. A.). (*Agr. Engin.*, 22 (1941), No. 8, pp. 281-283, figs. 6).—The author briefly describes present practices with gin bales, gin buildings and press types, and engineering features and performance of gin presses. He adds some account of an experimental cotton-gin press used by the U. S. D. A. Bureau of Agricultural Chemistry and Engineering and the Agricultural Marketing Service in producing standard-density bales of 24 lb. per cubic foot. The major elements of the all-steel construction are shown in drawings. A maximum load of 500 tons is planned for

three rams, of which the travel is slightly more than 8 ft. One side of the press is fitted with a box 20 in. wide by 54 in. long by 111.5 in. deep, the other side is the conventional 27 by 54 by 111.5 in. in size. Bales of equal density pressed in the narrow box required about half as much pressure as those from the wide one, a reduction of 25 percent in width thus causing a reduction of 50 percent in the required hydraulic pressure on the rams. A study of pumping and piping arrangements is also mentioned, together with a device invented at the Cotton Ginning Laboratory to retain low-power requirements as pressures rise by cutting pump cylinders out of load service on proportionate steps of pressure.

Dehydration of sweet potatoes for livestock feed, A. B. KENNERLY. (U. S. D. A.). (*Agr. Engin.*, 22 (1941), No. 8, p. 296).—Cull sweetpotatoes for livestock feed are (1) washed in flumes, (2) from the flume they are dropped into a grinder, (3) the ground material is treated with sulfur dioxide to prevent oxidation of vitamin A, (4) small amounts of the dried meal are mixed with the wet material, which hastens the drying process, and (5) the material is run through a drier at about 55° C., where it is dried to about 10 percent or less moisture content. After this it will not absorb moisture from the air in storage.

The washing flume is a spray rotary washer, the potatoes being fed directly into the washer or carried to it from the storage bin by means of a flume of water. For grinding the potatoes the standard meat grinder was used for the most part. Further experiment, however, showed that a saw-tooth rasp grinder would do satisfactory work. Fourteen 6-in. and twelve 7-in. saw blades were placed side by side on a shaft mounted in a housing to form the hopper. This machine gave a grinding length of about 3 in., with variations in size from a long shred to finely pulverized material. One ton of potatoes required about 2 lb. of sulfur to make the necessary sulfur dioxide gas, the gas being liberated by burning the sulfur. The drier required well-controlled heat. A rotating drum hot-air unit was used, its temperature ranging from 80° to 100°, though the product itself seldom exceeds 55°.

A summary of barn hay curing work, J. A. SCHALLER (*Agr. Engin.*, 22 (1941), No. 8, pp. 292, 295, fig. 1).—Barn hay-curing systems are now in use on farms in Connecticut, Rhode Island, Pennsylvania, Ohio, Virginia, Tennessee, and Alabama, a total of 13 such systems being known to be in operation when this paper was written. These systems (1) eliminate the weather risk, and (2) make a hay of superior quality, with an investment cost between \$250 and \$350 for blower, motor, lumber, electrical supplies, control equipment, etc., and with an average operating cost of only 39 kw.-hr. per dry ton. The barn-cured hay averaged four times as much carotene, three times as much vitamin A, 2.3 percent more leaves, and 19 percent more green color than field-cured hay.

One of these barn driers on a farm at New Milford, Conn., covers a mow floor area of 36 by 120 ft., or 4,320 sq. ft. Four large butterfly valves in the main duct make it possible to use only parts of the system at one time, if desirable. A 48-in. propeller-type fan driven by a second-hand automobile engine forces heated air through the hay. The fan unit is tied into a cinder block heat chamber provided with a wood-burning furnace. Other systems, some with and some without artificial heating of the air, are also briefly described. The type of automatic control considered the most promising uses a humidistat outside the barn to start or stop the blower motor in accordance with the humidity of the air, together with a time switch to start and stop the motor for short operating periods during the night for the first few nights to prevent overheating, or for any time intervals desired by the operator.

Ventilation of animal shelters, J. C. WOOLEY (*Missouri Sta. Cir.* 219 (1942), pp. 6, figs. 4).—Simple and inexpensive natural draft-insulated ventilating flues

and fresh air inlets of several forms are briefly described and are shown in diagrammatic drawings. Mechanical draft ventilation is also mentioned, but information on this type of ventilation is confined to a table of fan sizes and speeds to provide adequate ventilation for specific numbers of cows, horses, hogs, or hens.

Engineering aspects of electric brooding in winter, J. E. NICHOLAS, E. W. CALLENBACH, and R. R. MURPHY. (Pa. Expt. Sta.). (*Agr. Engin.*, 22 (1941), No. 10, pp. 345-349, figs. 9).—Two electric brooding experiments were made under cold-weather conditions with 3,532 chicks of two different breeds under eight electric brooders of the same size, make, and design. Comparable brooding conditions were provided except for respective allowances of 7, 11, 15, and 19 sq. in. per chick of brooder area. Voltage variation, particularly low voltage caused by too light a service wiring, was shown to influence seriously the generation of sufficient heat under brooders in cold weather and to reduce greatly their efficiency. Brooder thermometer temperature readings served as a guide to conditions under an electric brooder, but temperature control and ventilation requirements were found sometimes best effected by elevation or lowering of the brooder canopy. In crowded brooder houses, the problem of extreme dampness in cold weather may be partially remedied by the use of an exhaust fan. The economics of this procedure were not studied, however. Energy consumption per chick reared was less for the largest group of chicks. No consistent relationship was found to exist between number of chicks and energy consumption per group or between number of chicks per group and brooding mortality. An allowance of 7 sq. in. of brooder area per chick resulted in the highest mortality, however.

Architected homes for American farms, A. C. HUDSON. (U. S. D. A.). (*Agr. Engin.*, 22 (1941), No. 10, pp. 344, 349).—This is a brief discussion based upon the three principles that (1) the house must be functional, serving efficiently the purpose for which it was intended; (2) it must be economical, unnecessary features being eliminated and space arranged for maximum utility; and (3) it must be suited to its environmental conditions of climate and site. It is recognized, however, that standards of design must be considered equally with standards of construction. Even at some slight increase in cost, elements whose primary justification is their decorative quality must be regarded as essential to the pleasure which the owner will take in his home.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics by the New Jersey Stations]. (Partly coop. U. S. D. A.). (*New Jersey Stas. Rpt. 1941*, pp. 22-24, 27, 28, 54-55, 86-87, pl. 1).—In addition to results previously noted are (1) findings as to the costs per year of keeping a dairy cow and the average butterfat costs per pound in 66 dairy herds for the year August 1, 1938-39, (2) tables showing by family income groups the daily consumption of fresh milk per member in 574 families with children in New Brunswick, Highland Park, Newark, and the Oranges, (3) causes of failure in one-man poultry-and-egg farms, (4) statement as to the best program on farms growing lima beans and peas for quick freezing, and (5) statement as to the problem of tax delinquency in relation to land use.

[Investigations in agricultural economics by the New Mexico Station in 1941] (*New Mexico Sta. Rpt. 1941*, pp. 12-14).—Results not previously noted are reported as follows: (1) A table showing for the lamb-feeding seasons from 1936-37 to 1940-41 the average returns per head sold, ton of alfalfa fed, and dollars' worth of feed fed; (2) a brief statement as to the average net cost of ginning, sterilizing, and wrapping of cotton to members of 13 cooperative ginning associations studied in 1940-41 and the savings to growers over commercial rates;

and (3) tables showing (a) average financial and physical data for 29 cattle, 9 sheep, and 12 mixed ranches studied in 1939 and (b) intensity of grazing in relation to livestock production on 27 cattle ranches in New Mexico in 1939.

[Investigations in agricultural economics by the South Carolina Station, 1941]. (Partly coop. U. S. D. A.). (*South Carolina Sta. Rpt. 1941, pp. 11-20, figs. 2*).—In addition to results previously noted, some findings are included as to (1) the operating seasons and relationship between the quantity of certain products canned and the canning capacity of 19 of 20 commercial canneries in the State in 1940 as shown by a study made by J. M. Stepp, and (2) the use of productivity indices in land classification in Edgefield County in a study by G. H. Aull and J. T. Lund.

Current Farm Economics, [April 1942] (*Cur. Farm Econ. [Oklahoma Sta.], 15 (1942), No. 2, pp. 41-68, fig. 1*).—Included are the usual reviews of the agricultural situation; the usual tables of prices, price indexes, etc.; and the following special articles: Livestock on Farms, January 1, 1942, by D. L. W. Anker (pp. 48-51); Reaction of Producers to the Cotton Situation, by K. C. Davis (pp. 52-53); and Conservation Sets the Stage for "Food for Freedom" on Small Cotton-Corn Farms, by E. A. Tucker (pp. 54-65).

[Investigations in agricultural economics by the Washington Station] (*Washington Sta. Bul. 410 (1941), pp. 51-52*).—Among the studies reported are the following: Land-use adjustments in Washington, by B. H. Pubols and S. W. Schwartze (coop. U. S. D. A.), and supply and price relationships for Washington apples, by M. T. Buchanan and E. F. Dummeler.

Farm management aspects of the war, J. C. DONETH and K. T. WRIGHT (*Michigan Sta. Cir. 182 (1942), pp. 39, figs. 20*).—Part 1 of this circular discusses the interest of farmers in prices, part 2, the behavior of farm prices and costs as compared with World War I, and part 3, good farm management for the future.

During 1941 wholesale prices of all commodities in the United States rose 18 percent and farm prices in Michigan 30 percent. Farm operating costs rose about 20 percent in the year and almost doubled from 1914 to 1920. Living costs on the farm rose 13 percent during 1941. These price changes cause farm prosperity for the present, but it is thought that unfavorable farm price-cost relationships probably will develop after this war is over and last several years. "Farm income in 1942 probably will be higher than last year. Farm expenses probably will be higher. Net farm income will likely average about the same as 1941."

Financing production of food for freedom (U. S. Dept. Agr., Misc. Pub. 488 (1942), pp. 8, fig. 1).—This pamphlet has been prepared to furnish information on the credit needs growing out of the food-for-freedom effort and to help guide agricultural credit during this critical period into the most productive channels and away from uses likely to cause trouble later.

Mayor producción agrícola como arma defensiva en la guerra [Greater agricultural production as a defensive weapon in the war], J. A. B. N[OLLA] (*Agr. Expt. [Puerto Rico Univ. Stu.], 2 (1942), No. 1, pp. 2-4, 8*).—The director discusses the problem of producing food not only for the civil population of the island but also for the war needs and the part that the station is playing in these efforts.

Foreign Agriculture, [May 1942] (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr., 6 (1942), No. 5, pp. 165-207, figs. 3*).—Included are the following articles: Thailand's Agricultural Economy, by W. I. Ladejinsky (pp. 165-184); The Evolution of the Argentine Grain Price-Guaranteeing Policy, by L. C. Nolan (pp. 185-203); and Food Rations in Germany, by J. H. Richter (pp. 204-207).

Farm resources and farming systems needed to meet living needs of farm families in five type-of-farming areas.—I, Summary, D. R. RUSH and O. F.

LARSON (*U. S. Dept. Agr., Bur. Agr. Econ., 1942, pp. [2]+16, fig. 1*).—This is the first of a series of reports on farm organization for family-sized farms in five areas—the lower Piedmont of Georgia and South Carolina; the Delta of Mississippi, Louisiana, and Arkansas; southeastern Colorado and northeastern New Mexico; north central South Dakota; and south central Minnesota. It summarizes the findings for these areas, each of which will be dealt with in full in subsequent sections of the series.

An economic study of land utilization in Sussex County, Delaware, R. O. BAUSMAN (*Delaware Sta. Bul. 233 (1941), pp. [2]+66, figs. 21, map. 1*).—This bulletin follows the same general plan as Bulletin 228, An Economic Study of Land Utilization in New Castle County, Delaware (E. S. R., 85, p. 548).

Farm management on central Maine farms with dairy enterprises, E. RAUCHENSTEIN and A. E. WATSON. (Coop. U. S. D. A.). (*Maine Sta. Bul. 408 (1942), pp. 101-159*).—From records of income, expenses, crop and livestock production, and farm practices obtained on 214 farms in central Maine for the year begun May 1, 1936, it was found that the net farm income per farm amounted to \$452 and the labor income to \$143 per farm. A study of individual farms that were well above the average in net income indicates that they usually had larger than average sized business. Usually this was brought about by having more than the average acreage of cash crops, especially potatoes, and a higher than average milk production per cow. Experimental results obtained by treating pasture with lime, phosphorus, and potash, or with nitrogen, phosphorus, and potash indicate that such practices might be advisable on the best pasture and hay land in the area.

Economic conditions and problems of agriculture in the Yakima Valley, Washington.—III, Fruit farming, E. B. HURD, C. P. HEISIG, M. CLAWSON, H. F. HOLLANDS, and B. H. PUBOLS. (Coop. U. S. D. A.). (*Washington Sta. Bul. 409 (1941), pp. 97, figs. 18*).—In continuation of this series (E. S. R., 85, p. 548), it was found that fruit farms in the Yakima Valley are characterized by extreme specialization—90 percent of the irrigated land of such farms being in orchard. There is little crop production other than fruit, and there are few livestock. Alternatives for diversification are limited as long as present fruit trees stand. Fruit production is characterized by high costs per acre, and many of these costs are cash costs, almost all of which are unavoidable even though returns are low. In 1937, the cash costs varied from about \$210 per acre on apple farms to \$125 on apple-pear-stone fruit farms. The average apple farm with from 25 to 50 acres in orchard was able to pay all costs, including wages to the operator but not interest on investment, with a yield of 425 boxes per acre at a net return to the grower of 40 ct. per packed box (after deducting packing charges of approximately 38 ct. per box); with a yield of 265 boxes at 60 ct.; but only with a yield of about 1,100 boxes with a return of 20 ct.

In view of the prospective prices, the conclusion seems inescapable (1) that many orchards with low yields cannot earn sufficient money to remain in production, and (2) that the average small orchard (less than 25 acres) is under a serious handicap because of its high cost of operation.

The dairy industry in the United States, 1940-41: Selected references on the economic aspects of the industry, N. G. LARSON (*U. S. Dept. Agr., Bur. Agr. Econ. Bibliog. 97 (1942), pp. [1]+133*).—Included are 485 selected, annotated references on the economic aspects of the industry issued mainly between June 1940 and December 1941, and supplementing Economic Library List 11 (E. S. R., 83, p. 834). The references are classified under the following headings: General, advertising, bibliographies, butter, cheese, containers, creameries and cooperatives, dairy corporations, dairy herds, effects of war, evaporated and

condensed milk, farm management, grades and standards, ice cream, marketing, marketing control, prices, statistics, strikes and labor controversies, trade barriers, and addenda. Unsigned articles, with a few exceptions, and references on breeding, sanitation, nutrition, milk plant management, the technical aspects of production, etc., are not included.

Dairy farm management and costs in Pennsylvania, W. L. BARR (*Pennsylvania Sta. Bul.* 421 (1942), pp. [2]+34, figs. 4).—Analysis is made of cost accounts of the dairy enterprise kept by cooperating farmers in various parts of the State who were producing milk for fluid markets. Of the records, 79 were obtained in 1938, 53 in 1939, and 74 in 1940. Accounts were kept by 117 different farms for at least 1 of the 3 yr.

Labor income averaged \$594, \$560, and \$755, and returns per hour of labor from the dairy enterprise were 35, 23, and 29 ct., respectively, for the 3 yr. Feed and bedding costs averaged 50 percent, labor 80 percent, and other costs 20 percent of the gross cost of producing milk. On an average, 2.1 hr. of labor, 32 lb. of grain, and 81 lb. of silage were required to produce 100 lb. of milk. In each of the years the large farm businesses had higher average labor incomes, greater average returns per hour of labor from the dairy enterprise, and lower costs of milk production than did small farm businesses. Farmers operating land with high rates of crop production and having herds with rates of milk production above the average were more successful in making high labor incomes. "Farms moderately above average in size of business, labor efficiency, crop yields, and rate of milk production were more successful than were farms that were extremely high in one factor but below average in the others."

Lamb feeding in the irrigated valleys of southern New Mexico, H. B. PINGREY (*New Mexico Sta. Bul.* 285 (1941), p. 46, figs. 5).—In 1938 the number of lambs and sheep fed was estimated to be 38,000, but has since nearly trebled. Lamb feeding has increased primarily as a means of marketing much of the large production of alfalfa hay and other roughage grown on the irrigated farms of the Pecos Valley. The lamb-feeding enterprise has been a profitable means of disposing of farm-raised feeds. The average return for the alfalfa and other roughage (alfalfa equivalent basis) fed to lambs was \$13.24 a ton for the period 1936 to 1939. During the 4-yr. period of study, feeder lamb prices averaged about \$7 a hundredweight at the farm feed lot. Purchase cost constituted 62 percent, feed 30 percent, labor 3 percent, miscellaneous cash 3 percent, death loss 1 percent, and use of equipment 1 percent of the feed-lot cost of \$7.32 a head. The total cost at the market was \$8.07 a head, or \$8.82 a hundredweight.

The various factors affecting the profitableness of lamb feeding in the region are discussed.

Organization and efficiency of dry-land wheat farms in eastern Idaho, L. J. FENSKE and P. A. EKE (*Idaho Sta. Bul.* 243 (1942), pp. 14, figs. 2).—Data for 1939 were gathered by the survey method from 72, 51, 51, and 60 dry-farm operators, respectively, in Teton, Madison, Fremont, and Oneida Counties. The tenure; capital investment; land utilization; average receipts, expenses, and operator's earnings; and wheat yields are discussed for each county. Analysis is made of the effects on earnings of size of farm, crop yields, class of land, and efficiency factors. "Of the factors affecting earnings, farm size was of major importance. Farmers having less than 480 acres of cropland had, on an average, earnings too low to maintain desirable levels of living."

Compilation of Soil Conservation and Domestic Allotment Act, as amended, Agricultural Adjustment Act of 1938, as amended, Federal Crop Insurance Act, as amended, Sugar Act of 1937, as amended, laws and

executive orders concerning the Commodity Credit Corporation, related appropriation items, and miscellaneous laws (*U. S. Dept. Agr., Agr. Adjust. Admin., 1942, pp. VII+164*).—This report was prepared under the direction of the Solicitor of the Department of Agriculture.

Planning for conservation on small tobacco farms, Franklin County, North Carolina: Economic considerations involved and probable economic effects, S. W. ATKINS. (Coop. U. S. D. A.). (*North Carolina Sta., AE-RS Inform. Ser. No. 8 (1941), pp. [4]+24, figs. 2*)—This report is the first in a series relating to the economic effects of recommended conservation programs of the Soil Conservation Service. Small tobacco farms represent a group of farms in the Cedar Creek Demonstration Area on which relatively few cooperative agreements have been formulated, although these farms comprise roughly one-third of the farms in the area.

Land-tenure classification and areas in Kentucky, J. H. BONDURANT and W. C. BINKLEY. (Coop. U. S. D. A.). (*Kentucky Sta. Bul. 421 (1942), pp. 50, figs. 24*).—This report consists of two principal parts: (1) Pointing out and describing the tenure groups and subgroups which are important in the handling of Kentucky's farming lands, and in affecting the welfare of the farming population: and (2) pointing out geographic areas in the State within which there are similarities in types of tenure and in factors associated with and affecting the tenure situation. Both tenure areas and tenure groups are described in detail.

It is pointed out that some of the tenure classifications used in the U. S. census of agriculture do not lend themselves well to the distinctions needed in describing and analyzing tenure conditions in Kentucky.

Agricultural land ownership and operating tenures in Casa Grande Valley, P. GREISINGER and G. W. BARR. (Coop. U. S. D. A.). (*Arizona Sta. Bul. 175 (1941), pp. [2]+279-292, pl. 1, figs. 9*).—Data are presented as to the farmed lands and lands not in farm units held in private ownership and the Federal- and State-owned lands. The farm operating units, leasing practices, tenure problems, etc., are described and discussed, and suggestions are made for improving the land tenure situation.

Arizona farm leases, E. D. TETREAU (*Arizona Sta. Bul. 179 (1942), pp. [2]+389-407, figs. 2*).—Some of the advantages of share and cash leases are described, and measures for the improvement of such leases are discussed. The leasing practices of the State are also described and discussed. Attention is called to points to be remembered in drawing up a lease, and a flexible farm lease form for use for irrigated farms is included.

Buying land? Avoid foreclosure, G. LUNDY (*South Dakota Sta. Cir. 36 (1942), pp. 12, fig. 1*).—Information in the form of questions and answers is included "to help South Dakota farmers avoid being caught in another costly mortgage foreclosure epidemic sometime after the present war has ended."

Farm-mortgage credit facilities in the United States, D. C. HORTON, H. C. LARSEN, and N. J. WALL (*U. S. Dept. Agr., Misc. Pub. 478 (1942), pp. VII+262, figs. 49*).—"This report brings into compact form results of extensive farm-mortgage credit research conducted by the Bureau of Agricultural Economics over many years. . . . The report represents an attempt to synthesize pertinent information so it will be more useful in the consideration of current problems relating to farm-mortgage credit facilities." It "is intended to serve a principal purpose of providing a compact summary and analysis of factual material on farm-mortgage credit heretofore available only in scattered sources. At the same time it is intended to orient the major current problems and public issues in the farm-mortgage credit field."

Part 1, Historical Background of Present Farm-Mortgage Credit Situation, surveys broadly the major developments in farm-mortgage credit from before the first World War in chapters on fluctuations in outstanding farm-mortgage debt, 1910-40; sources of farm-mortgage credit; farm-mortgage interest rates and interest charges; and major developments in the farm-mortgage credit structure, 1929-39. Part 2, Federally Sponsored Farm-Mortgage Loan Agencies, reviews the development of existing Federal farm-mortgage corporations with chapters on Federal land banks; land bank commissioner loans; joint stock land banks; Farm Security Administration; and major trends and development of Federal participation in farm-mortgage lending, 1916-41. Part 3 "explores the major current issues and problems in farm-mortgage credit, primarily to lay bare the basic issues and problems involved and to indicate the interrelations between the several major groups of these issues and problems." It includes chapters on the competitive pattern of the farm-mortgage credit field, issues and problems relating to the role of the Government in farm-mortgage credit, standards of loan policy for Federal land banks, problems of national farm loan associations, farm-mortgage credit subsidies, and adjustment of farm debts. A statistical appendix (pp. 219-257) is included.

Assessment procedure and problems in South Dakota, N. J. ANDERSON (*South Dakota Sta. Bul.* 355 (1941), pp. 24+[1], pls. 2, figs. 3).—"The purpose of this study is to present information concerning the administration of the general property tax in South Dakota and to indicate probable weaknesses in the present system of assessment. The equalization of assessed values, which follows assessment in administrative procedure, is not stressed because it holds a position secondary to assessment." The present assessment methods in South Dakota are described. The problems arising from the present methods are discussed, and an evaluation is made of the assessment procedure. A brief review is included of the approaches made by several other States to solve problems similar to those in South Dakota. Land classification for assessment purposes is discussed and illustrated with data as to Hand County, S. Dak. A table shows the assessed valuations by townships in Hand County in 1940 before land classification and in 1941 after land classification. Maps show by 160-acre tracts the assessed valuation in 1940 and the land classification "in terms of soil type, slope, susceptibility to erosion, availability of well water, nearness to market, and other factors affecting the productivity of land." Supervision of assessment, objective valuation of property through classification, and the county unit system of assessment are suggested and discussed as practical remedies for the assessment weaknesses in the State.

Classification and rating of farm fire risks, K. H. HUNTER (*U. S. Dept. Agr., Farm Credit Admin. Bul.* 46 (1941), pp. IV+44).—"The main objective of this study was to determine a simple method of setting up a classification and rating system based upon an analysis of adequate loss experience. To attain this objective, the records of three Shenandoah Valley farmers' mutual fire insurance companies were studied in detail, and the experience of several other companies was analyzed in part."

Reinsurance among farmers' mutual fire insurance companies, V. N. VALGREEN (*U. S. Dept. Agr., Farm Credit Admin. Bul.* 45 (1941), pp. IV+32).—"The purpose of this bulletin is to make clear the significance and value of reinsurance, to outline the several ways adopted by farm mutuals for providing themselves with reinsurance protection, and to explain the various forms of protection thus provided. . . . It deals only with those forms that have been found adapted to the needs of farmers' mutual fire insurance companies."

Possibilities and limitations of coöperative marketing, H. E. ERDMAN (*California Sta. Cir.* 298, rev. (1942), pp. 19).—This is a revision of an earlier publication (E. S. R., 54, p. 82).

Las cooperativas de mercadeo de hortalizas pueden funcionar con éxito en Puerto Rico [Horticultural cooperatives can function successfully in Puerto Rico], J. MAISONET (*Agr. Expt. [Puerto Rico Univ. Sta.]*, 2 (1942), No. 1, p. 7).—The author presents some of the results of a study of four fruit and vegetable cooperative associations which functioned in the island in 1939-40 and which were located in the municipalities of Jayuya, Villalba, Isabela, and Rio Grande. The total sales of these cooperatives amounted to \$110,000, and their exports constituted about 40 percent of the total value of horticultural exports from the island.

Marketing potatoes through the Ohio Farm Bureau Cooperative Association, C. W. HAUCK and A. W. MCKAY. (Coop. Ohio Expt. Sta.). (*U. S. Dept. Agr., Farm Credit Admin. Bul.* 42 (1941), pp. IV+60, figs. 14).—"It was the purpose of the study to appraise as accurately as possible the degree of success the association has had in realizing the objectives of the committee responsible for the program and the value of its services to Ohio potato growers. Such an appraisal was made in part from the analysis of its sales records and in part from the opinions and attitudes which growers and buyers have developed as a result of the program. In addition, those conducting the study undertook to determine the potato growers' understanding of the association's program, the degree of support which they have given or are likely to give to it, and the parts of the program which they consider helpful and those which they believe should be changed." The need for a marketing plan, the development of the program, and the program for 1939-40 are discussed. Analyses are made of the association records of sales for the seasons from 1936-37 to 1939-40, the attitudes obtained by interviews of 38 dealers buying from the association, and the opinions and attitudes of 535 commercial growers interviewed. The progress made by the association and further developments that are needed are discussed. An appendix includes details of the program of the association and statistical tables.

The marketing of greens, J. W. PARK and M. E. SMITH (*U. S. Dept. Agr. Cir.* 644 (1942), pp. 55, figs. 19).—The term "greens" as used in vegetable marketing is generally understood to refer to green leaves and stems of plants which are usually boiled for food. Growers market greens by various methods, including sale to local or cash buyers mostly at packing sheds, and sale on farmers' markets, or to wholesalers or chain-store organizations in nearby cities. Shippers in producing areas sell f. o. b. and consign. For eight representative cities, about 71 percent of the supply of greens arrived by truck in 1940. Long-distance shipments of greens, however, are mostly by rail. Market prices of greens vary widely, being influenced by volume of supply, quality, and other factors. City wholesale prices of leafy greens in the period 1936-40 have mostly been within the range of 25 ct. to \$1 per bushel.

Receipt records indicated that approximately 1 bu. of fresh greens per capita was used annually in eight large cities in 1938-40. In these cities spinach comprised about 57 percent of the supply of greens, broccoli 12, kale 4, and other greens 27 percent.

Marketing fruits, vegetables, and nuts: A selected and annotated bibliography, F. C. BELL (*U. S. Dept. Agr., Farm Credit Admin., Misc. Rpt.* 46 (1941), pp. [2]+VI+259).—This selected, annotated bibliography includes 699 references to publications in English during the period 1931-40 (with a few exceptions) and classified under the following headings: National defense, the war, and marketing; credit; fruits, vegetables, and nuts; fruits; vegetables

and melons; nuts; standardization, grades, packages, packaging, labels, inspection, and enforcement; markets; roadside markets; and bibliographies and indexes. In general, the references are confined to the marketing of fruits, vegetables, and nuts grown in the United States. "Titles on the marketing of these commodities—fresh, dried, and canned—include the subjects of standardization, grades, packages, packing, labelling, markets, marketing methods, marketing economics, and marketing information." Some material is included on costs, prices, returns, inspection, enforcement, credit, exports, and possible effects of World War II upon the outlook for growers, but not on such subjects as processes of canning and drying, transportation, diseases in transit, storage, diseases in storage, market diseases, frozen food, imports, and tariffs. A subject-author index is included.

A survey of community canneries in South Carolina, J. M. STEFF (*South Carolina Sta. Cir. 61 (1942), pp. 11, figs. 6*).—Tables and maps are included showing the number of No. 2-equivalent cans of different products canned by 81 community canneries in 32 counties in 1940; the percentages of total canneries production by products by counties; the ratios of peaches, green beans, and tomatoes to total products; and the production, capacity, and ratio of actual operation to full capacity of 67 of the canneries. The 67 canneries studied operated at an average of 22.6 percent of full capacity in 1940. The author states that "about 140 community canneries are in existence in South Carolina and ready to operate during the 1942 canning season. Even if . . . the new canneries erected in 1940 and 1941 are smaller than the older ones, the average capacity per cannery will amount to about 45,000 No. 2-equivalent cans per year, or a total capacity for the State of about 6,300,000 No. 2-equivalent cans."

Sales and distribution policies of cooperative canneries in the United States, H. C. HENSLEY (*U. S. Dept. Agr., Farm Credit Admin. Bul. 48 (1941), pp. VIII+93, figs. 14*).—The channels of distribution generally used by the more than 100 cooperative canneries in the United States include the food broker, the wholesale grocery or the chain store, and the retail food store. Almost without exception cooperative canneries use brokers in making sales, although occasional sales are made direct to large buyers. The independent grocer is the principal customer of cooperative canneries. Many cooperative canneries are getting national distribution of their products. Cooperative canneries, almost without exception, sell at least a portion of their packs under their own brands. They also sell goods of the same quality similarly priced under buyers' brands. The trend is toward brands that are owned by distributors. This trend appears to run counter to the interests of cooperatives, the members of which are the beneficiaries of any successful promotion of their own brands. About one-fourth of the canneries are members of some central sales agency through which a portion, or all, of their sales are made. A brand policy that permits selling either under packers' brands or distributors' brands is deemed desirable.

Factors influencing the efficiency of operation of lemon packing-houses.—A preliminary report, J. M. TINLEY and J. E. HODGES (*California Sta. Mimeog. Rpt. 78 (1942), pp. [2]+72, figs. 11*).—The subject matter is presented in a series of tables and figures, with explanations.

Cost of marketing hogs shipped to the Omaha market, G. H. LAMBRECHT and L. F. GAREY (*Nebraska Sta. Bul. 340 (1942), pp. 16, figs. 9*).—Data were obtained from two important livestock commission agencies operating in the Union Stock Yards, Omaha, Nebr., covering 235,547 hogs consigned to the agencies during the period 1930-35 from various points in the State. The services rendered by transportation agencies and the terminal market services are described. Analysis is made of the cost of transportation by rail and truck;

terminal market costs; the relationship of transportation costs to total costs; the relationship of transportation and marketing costs to prices; and the cost of terminal market services on hogs shipped by rail, commercial trucks, and other trucks.

"The average annual costs per head at the terminal market for hogs shipped by all of the various methods of transportation were as follows: Inspection, 0.5 ct.; yardage, 13.3 ct.; feed in yard, 10.5 ct.; insurance, 1.9 ct.; commission 25.4 ct. and other costs, 1.0 ct." The costs were generally lower on hogs shipped by rail than by truck. The shippers received a larger proportion of the gross selling price when the price of hogs was high than when the price was low. The percentage of all hogs shipped to Omaha that were brought by truck increased from 47 in 1930 to 93 in 1935.

Bottled milk deliveries, H. B. ELENBERGER (*Vermont Sta. Bul.* 486 (1942), pp. 12, fig. 1).—The data obtained in a survey of milk distribution in Burlington, Vt., are summarized. Records were obtained for 43 of the 44 milk routes, covering the time consumed in each operation from the loading of the delivery truck, through all deliveries, and including the return trip and unloading of empty bottles and returns; the location of each stop; the amounts delivered and the time required; the routing of the trucks; and the time of each en route. The refrigeration facilities in 161 and 101 homes, respectively, in two sections of the city are also reported.

Ways of conserving tires and reducing other expenses in the distribution of milk, R. ANDERSON and L. SPENCER. (Cornell Univ.). (*Milk Plant Mo.*, 31 (1942), No. 3, pp. 24-27, 34, 38, 45, 50).—The adoption of alternate-day delivery, discontinuing or exchanging customers that are expensive to serve, drastic curtailment of call-back and special deliveries, and a change from early-morning to daylight deliveries are proposed as effective means of reducing delivery truck mileage and milk distribution costs.

An objective method of sampling wheat fields to estimate production and quality of wheat, A. J. KING, D. E. McCARTY, and M. McPHERK. (Coop. Kans., N. Dak., and Iowa Expt. Stas.). (*U. S. Dept. Agr., Tech. Bul.* 814 (1942), pp. 87, figs. 45).—It appears that the route sampling of a crop of wheat at or prior to harvest furnishes a useful method for estimating quality and production. The survey method of route sampling will probably be most useful in unusual years when abnormal development of the wheat crop creates production conditions not readily detected by usual crop reporting methods.

Slight bias is believed to occur in the estimates of protein and test weight because some fields were sampled too long before harvest. Of several attributes of yield examined, number of heads and plant height appear to be most useful in forecasting the yield of wheat from plant observations taken 3 or 4 weeks before harvest.

Statistical analysis of the seasonal average F. O. B. prices of California winter and summer oranges, 1922-23 to 1939-40, H. R. WELLMAN and G. M. KUZNETS (*California Sta. Mimeog. Rpt.* 77 (1942), pp. [1]+12, figs. 2).—The authors present the results of an analysis of the major factors influencing the seasonal average f. o. b. prices of California winter and summer oranges from 1922-23 through 1939-40.

Relation between auction prices and supplies of California fresh Bartlett pears, S. HOOS and S. W. SHEAR (*Hilgardia [California Sta.]*, 14 (1942), No. 5, pp. [1]+233-319, figs. 12).—"A primary purpose of the present study is to present more factual information than heretofore has been available on certain characteristics of the price behavior of California Bartlett pears. Special attention is given to particular relations within the complex of pear prices, and various

influences that enter into the determination of auction market prices are analyzed and discussed. A secondary purpose of the study is to present some analytical background that is necessary in order to view the recent development of the California fresh Bartlett pear industry and understand its present status."

The analyses are presented and discussed under the following headings: (1) Relations between weekly auction prices and sales; (2) price relations between auction markets; (3) relations between pears and other fresh fruits; and (4) analysis of season's average prices. Appendixes describe (1) the method used in computing the trends in ratios of prices and unloads of pears, plums, peaches, and oranges; and (2) the relations of pears to plums, peaches, and oranges based on linear arithmetic demand functions. Basic tables are also included.

"The pronounced seasonal variation in the weekly auction prices of California fresh Bartlett pears is directly related to the marked seasonal tendency in their shipments and auction sales. The seasonal patterns in sales and prices are inverse, but do not correspond perfectly; auction sales usually reach their maximum volume in the fourth or fifth week of the marketing season, and prices reach the lowest point during the interval from the third to the sixth week. The seasonal variations in sales and prices do not perfectly correspond in any two seasons, but in all years the timing and magnitude of weekly changes in sales and prices follow a definite pattern. . . . Season's average prices in various auction markets closely approximate each other. . . . The weekly prices in different auction markets follow broadly similar patterns of seasonal movement, but in some weeks prices in one market deviate widely from those in other markets. . . . Examination of the relations of pears to other fresh fruit indicates that fresh plums and fresh peaches compete with California fresh Bartletts in consumption. The relation between Bartlett pears and oranges, however, is not so clear. . . . The annual changes in auction-market prices of California Bartletts during the 1929-1940 period have been primarily determined by variations in the following four major price influences: (1) The level of nonagricultural income payments in the United States; (2) the volume of California fresh pear interstate shipments during the California Bartlett shipping season; (3) the volume of Oregon and Washington interstate shipments of fresh pears during the California Bartlett shipping season; and (4) a straight-line 'time' trend representing a persistent shift in the auction-market demand for California fresh Bartletts. . . . Statistical-demand analysis indicates that the auction-market demand for California Bartletts is elastic. Other influences remaining unchanged, a small decrease in auction price is associated with the proportionately larger increase in auction sales and an increase in auction gross returns; a small increase in auction price is associated with a proportionately larger decrease in auction sales and a decrease in auction gross returns."

Using feed price information to reduce production costs, H. M. HAAO (*Missouri Sta. Cir.* 230 (1942), pp. 8, figs. 4).—Some of the practical applications of information about seasonal price movements and economy of feeds are pointed out with a view to giving farmers and educational agencies serving farmers the facts to keep in mind in working out feed-buying programs.

Egg profit calculator, H. EMBLETON (*Arizona Sta. Bul.* 180 (1942), pp. [2]+409-417, figs. 4).—With the assumptions that feed costs constitute 60 percent of the total cost of producing eggs while other costs—depreciation, interest, replacement of flock, transportation, water, etc.—constitute 40 percent; that feed consumption per bird per year is 80 lb.; and that the number of eggs laid per bird per year is 12 doz.; a table was prepared showing, for eggs at prices per dozen of 60 to 15 ct. and feeds at different costs per 100 lb., the feed-egg ratio, feed cost per bird, total costs, total receipts, and net profits or loss. Another

table shows the feed consumption of light and heavy breeds of fowls for different ranges of egg production. Charts show comparisons of (1) feed prices, prices of eggs per dozen, and feed-egg ratios to assure a net profit of \$1 per bird per year; (2) net profits with different egg prices, the price of 100 lb. of complete ration being \$2; (3) net profits with increases of 25 ct. in feed prices for 100 lb. of complete ration with egg prices constant at 35 ct. per dozen; and (4) varying prices of feed and eggs to feed-egg ratios.

Some of the findings were: (1) There is no feed-egg ratio which divides profit and loss, (2) feed-egg ratios assuring a net profit of \$1 per bird per year vary from 1:4 to 1:7.7 as feed prices per 100 lb. advance from 60 ct. to \$4.65 per 100 lb. and egg prices advance from 15 to 60 ct. per dozen, (3) an advance of 5 ct. per dozen for eggs will absorb an increase of 45 ct. per 100 lb. in price of feed, (4) an advance of 5 ct. per dozen eggs increases the net profit 60 ct. per bird per year at a given feed price level, (5) an increase of 25 ct. per 100 lb. of feed will decrease the net profit 33½ ct. per bird per year with a constant egg price, and (6) the higher the price of eggs the less the range of feed-egg ratios at a given egg price with feed ranging from \$1.50 to \$3.75 per 100 lb.

Crops and Markets, [March 1942] (*U. S. Dept. Agr., Crops and Markets, 19 (1942), No. 3, pp. 61-84, figs. 5*).—The usual crop and market reports include tables and text on the production of citrus fruits; mohair production and income, 1934-41; average prices by States received by farmers for farm products, February 15, 1941 and 1942; prospective plantings of specified crops, 1942; and wool production and income, 1934-41.

RURAL SOCIOLOGY

Basic trends of social change in South Dakota, II, III, W. F. KUMLIEN. (Coop. U. S. D. A. et al.). (*South Dakota Sta. Buls. 357 (1941), pp. 20, figs. 8; 356, pp. 24, figs. 7*).—Two papers are presented in continuation of studies previously reported (*E. S. R., 81, p. 729; 85, p. 690*).

II. Rural life adjustments.—The subjects dealt with include the declining farm population and its decreasing proportion to nonfarm groups in the total population, increasing average size of farms, shifting emphasis in agricultural production, increased mechanization of farming, marketing of agricultural products within the State, part-time farming, farm tenancy, farm income and wealth, rural working conditions, and Government-assisted agricultural programs.

III. Community organization.—It is reported that the early settlement of the State resulted in a "pure isolated farm type" of community organization, which has persisted with little modification to the present day. The development of the automobile and good roads has had the most far-reaching effects upon community organization in South Dakota. These factors have overcome the obstacle of distance and made possible the enlarging of community areas and the reduction of the number of small trade centers. There are more old persons and fewer young, more native-born South Dakotans, more women, and a slower rate of population growth. During the last 10 yr. there has been a decided loss of population. All of these changes have had marked effects upon the social institutions of the State.

Quarter century of agricultural changes in southwestern Knox County, Tennessee, H. J. BONSER, R. G. MILK, and C. E. ALLRED (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 135 (1942), pp. VII+71, figs. 32*).—The changes included are concerned with an area subject to increasingly marked urban influence. The history of the farm operators, community changes since 1917, changes on selected farms, crop yields, changes in farm organization, who

performs farm work, prices received by farmers, farm wages, sources of income, current farm expenses, net returns from farming, and factors affecting incomes in 1916 and 1940 are discussed.

Changes in population in New York and their significance for local government, L. TSE-CHIU KUO ([*New York*] *Cornell Sta. Bul.* 775 (1942), pp. 46, figs. 3).—"This study is an inventory and description of significant changes in the numbers, composition, and distribution of the population in the State of New York and their significance for the local government of the State. Emphasis is given to the more general aspects of population changes, such as geographical distribution and age distribution. The population data used are principally those of the Federal census."

Farmers' attitudes toward certain agricultural and rural life programs, D. R. JENKINS and M. T. MATTHEWS (*South Carolina Sta. Rpt.* 1941, pp. 20-22).—Brief results of this study are presented.

The challenge to democracy.—VII, Improving public administration, H. C. COOK (*Iowa Sta. Bul.* P27, n. ser. (1942), pp. 717-732).—This is the seventh of a series of eight (E. S. R., 86, p. 698) on democracy.

Some problems of Minnesota rural youth, L. NELSON, D. MITCHELL, and E. T. JACOBSON (*Minnesota Sta. Bul.* 358 (1942), pp. 32, figs. 15).—The problem of youth is that of making a satisfactory adjustment into the adult life of the community. This induction into the adult life involves two main steps, namely, getting a job and establishing a home independent of the parents. The age, sex distribution, and education of Minnesota rural youth are discussed in their community relations and as regards employment and leisure on the farm.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Proceedings of the Association of Land-Grant Colleges and Universities (*Assoc. Land-Grant Colls. and Univs. Proc.*, 55 (1941), pp. [1]+V+339).—This report of the fifty-fifth annual convention held in Chicago, Ill., November 10-12, 1941, has been discussed editorially and noted (E. S. R., 86, pp. 1, 145, 288).

The "unit-operations" principle applied to agricultural engineering laboratory instruction, L. M. K. BOELTER and H. B. WALKER. (Univ. Calif.). (*Agr. Engin.*, 22 (1941), No. 8, pp. 289-291).—The unit-operations method of laboratory instruction is equivalent to the mode of analysis employed in physical instruction. The student is given the opportunity to note the experimental interrelation of variables in a system which is simple, and in which the independent variables are few in number and readily controlled. These actual systems yield readily to analytical attack, for they represent closely the ideal system (thought models) upon which the elementary analysis is based. The student must be given experimental experience in the synthesis of unit-operations as applied to actual machines or processes in order to accomplish a complete engineering educational sequence.

Farm shop practice, M. M. JONES (*New York and London: McGraw-Hill Book Co.*, 1939, pp. XIII+315, figs. 360).—The author points out that it is recognized more and more that for satisfactory achievement in shop work the student must study the subject systematically as well as work with his hands on practical jobs or projects in the shop. The book is planned to permit all possible flexibility in its use. It treats tools and tool processes separately and apart from any particular set of jobs or projects. It can be used, therefore, in connection with any jobs that meet particular local needs.

Following brief prefatory statements, part 1, dealing with farm woodwork and carpentry, contains chapters on measuring and marking; sawing; planing and smoothing; wood chisels and their use; boring and drilling holes in wood;

wood fastenings; use of modeling or forming tools—shaping curved and irregular surfaces; painting, finishing, glazing; and cutting common rafters. Part 2, taking up tool sharpening and fitting, consists of chapters on tool sharpening, grinding and sharpening equipment, and saw sharpening. Part 3, on cold-metal work, presents the topics general bench and vise work, drilling tools and their use, and bolt-threading equipment and its use. Part 4 consists of a single chapter on pipework on the farm and part 5 deals similarly with soldering and sheet-metal work. Part 6, presenting the subject of farm blacksmithing, covers blacksmithing equipment—forge fires; fundamental forging operations; forging and tempering tool steel; and welding, plow sharpening—kinds of iron and steel. Part 7 deals in one chapter with farm concrete work. Part 8, harness, belt, and rope work, has the chapters harness repair, belting, belt lacing; and rope work. A subject index concludes the book.

Manual of farm shop practice, M. M. JONES (*New York and London: McGraw-Hill Book Co., 1940, pp. XII+92, [figs.] 82*).—This manual consists of plans for devices and appliances that may be made in the farm shop or the school shop, selected mainly because of their value in helping students to learn the fundamental shop processes and because of the usefulness or value of the jobs when done. At the end of each job outline are given references, by chapter and paragraph number for each of the basic processes involved, to the author's textbook *Farm Shop Practice*, noted above.

FOODS—HUMAN NUTRITION

The nation's food (*Chem. and Indust.*, 60 (1941), Nos. 23, pp. 427-429; 25, pp. 457-464, figs. 3).—The following surveys were presented as contributions to the symposium on vegetables as food, arranged for the food group of the [British] Society of Chemical Industry: *The Effect of Canning on the Nutritive Value of Canned Vegetables*, by W. B. Adam, and *The Chemical Composition of Vegetable Foods and Their Place in Peace-Time and War-Time Diets*, by M. Pyke.

Food values of portions commonly used, A. DEP. BOWES and C. F. CHURCH, revised by A. DEP. BOWES (*Philadelphia: Philadelphia Child Health Soc., 1940, 4. ed., rev., pp. [4]+35*).—These useful tables of food values, now in the fourth edition, were prepared to supply authoritative data in a form for quick and easy reference, particularly by students of medicine, dentistry, dental hygiene, and public health nursing. The tables indicate, for a large number of foods, the number of calories, and the amounts of protein, fat, carbohydrate, and fiber, of calcium, phosphorus, and iron, of the several vitamins, and of excess acid or base in commonly used portions or measures, which are designated by dimensions or volume, with information as to the weight in grams. The foods are classified as follows: Breads, cereals and cereal products, dairy products, eggs, fats, fish, fruits, fruit juices, meats, nuts, sugars, sweets, vegetables, vitamin-rich products, and miscellaneous products. A brief summary is devoted to factors affecting nutritive values, dietary requirements at various ages are tabulated, and sources of data are noted.

[Research in foods and nutrition by the New Mexico Station] (*New Mexico Sta. Rpt. 1941, pp. 67-68, 68-69*).—Results were obtained in continuance of the study on iron and copper contents of pinto beans and the effect of pinto beans on the regeneration of hemoglobin in nutritional anemia of albino rats (E. S. R., 85, p. 268). There is also a preliminary report of investigations of chile peppers as sources of carotene and ascorbic acid.

[Foods and nutrition at the Tennessee Station] (*Tennessee Sta. Rpt. 1940, p. 81*).—This is a brief progress report (E. S. R., 85, p. 555) by F. L. MacLeod of studies concerning the ascorbic acid metabolism of college students

and the ascorbic acid intake required to maintain blood plasma ascorbic acid at the saturation level.

[Studies in foods and nutrition at the Washington Station] (*Washington Sta. Bul.* 410 (1941), pp. 53-55).—This progress report (E. S. R., 85, p. 556) includes summaries of studies on the vitamin C content of Washington pears and apples, and of frozen-pack peas and lima beans, the former as affected by the method of wrapping, the rate of increase of blood plasma ascorbic acid after ingestion of vitamin C, and the nutritional status of college women with regard to vitamin C, all by E. N. Todhunter and J. A. McIntosh; on the vitamin C content of frozen-pack berries and of rhubarb, by Todhunter; and on effect of methods and rates of irrigation on the cooking quality of Netted Gem potatoes, by M. M. Boggs and H. P. Singleton.

Moisture content of bread and its comparison with other staple foods in the diet, W. H. CATHCART (*Inst. Food Technol. Proc.*, 1 (1940), pp. 51-58, figs. 3).—In this study, involving tests on six samples of bread from each of six Chicago bakeries, it was found that the average moisture content 1 hr. after baking was 36.1 percent. The average moisture of wrapped samples 12 hr. out of the oven was 35.5 percent (range 33.5-36.7 percent). The average moisture of the unwrapped samples 12 hr. out of the oven was 33.9 percent (range 32.0-34.7 percent). Wrapped breads (wrapped when cool) 72 hr. out of the oven showed an average moisture loss of 2.7 percent, with losses slightly greater for sliced than unsliced wrapped samples. Unwrapped bread after 72 hr. showed an average percentage moisture loss of 11 percent. Weights of the dough upon scaling were obtained in most cases, and these values in comparison with the weights of the loaves upon coming from the oven showed an average moisture loss of 12.5 percent over this period. As the percentage of absorption of the dough was increased the percentage of moisture loss from the time of scaling until the bread was baked remained approximately the same, but the total moisture loss was greater from the high-absorption doughs than from those made with less water by the time the bread was 1 hr. old. The moisture loss from the time of scaling until the bread was baked increased as the baking time increased.

Effects of waxing on certain physiological processes of cucumbers under different storage conditions, W. B. MACK and J. R. JANEK. (Pa. Expt. Sta. coop. Univ. P. R.). (*Food Res.*, 7 (1942), No. 1, pp. 38-47).—Sound, graded greenhouse cucumbers were treated after overnight cellar storage by immersion in a water emulsion of a wax mixture (Brytene No. 284-D) containing 75 percent carnauba wax and 25 percent paraffin, the emulsion (35 percent) being diluted 1 to 6 by volume according to the manufacturer's direction. The cucumbers, removed from the emulsion, drained, and dried, were stored (1) at room temperature, (2) in a bank cellar, and (3) in cold storage for periods of 10, 17, and 24 days. Unwaxed controls were similarly stored. Data on weight losses, respiratory quotient, and content of dry matter and total and reducing sugars were obtained at the various intervals for all lots, which were also observed for physical appearance. The results indicated that "the most striking differences brought about by wax treatment were reduction in weight loss and in spoilage in the ordinary room; increase in pitting in cold storage, a characteristic low-temperature injury on cucumbers; and a significant increase in the respiratory quotient in cold storage, indicating a greater degree of suboxidation."

Protein and sulfur contents of immature lima beans (*Phaseolus lunatus*) as affected by varietal and environmental factors and processing, M. E. DAVIS, E. M. CHACE, and C. G. CHURCH. (Univ. Calif. and U. S. D. A.). (*Food Res.*, 7 (1942), No. 1, pp. 26-37).—Moisture and protein determinations were made

on 170 samples of frozen and 48 samples of unprocessed lima beans. In addition, 49 samples of frozen and 26 of unprocessed beans were analyzed for total sulfur. These determinations were made by Official methods, and the samples represented beans grown in experimental plats in eight regions in California from seeds selected from varieties of known genetic history. The selections were made from the four recognized morphological types, namely, the large flat, large thick, small flat, and small thick beans. The frozen beans were blanched and cooled in tap water before freezing.

The analyses, summarized and discussed as to their significance, showed that the protein content of the frozen beans averaged 6.65 percent, while that of the unprocessed beans averaged 7.27 percent; total sulfur in these two groups averaged 0.022 and 0.026 percent, respectively. The significant variations in protein and sulfur content of the moist beans were related to moisture content, since there was no significant difference between large and small types of beans in protein or in sulfur contents when these were calculated as percentages of the total solids. Both protein and sulfur, whether calculated on the moist or dry basis, were higher in seeds from some plats than in those from others. A highly significant direct correlation coefficient was found for protein and sulfur contents of lima beans and an inverse but highly significant ratio was shown to exist between protein and water and also between sulfur and water. Water blanching and color sorting lowered only slightly protein and sulfur percentages in total solids. It is concluded that "environment and water balance, rather than heredity, determine the levels at which nitrogen and sulfur occur in immature, green lima beans. There is slight change in the nitrogen and sulfur fractions of the total solids because of removal of white, immature beans or because of blanching, freezing, and drying processes."

Blackening of potato tubers on boiling, U. M. ROBISON (*Nature [London]*, 147 (1941), No. 3738, pp. 777-778).—This is a brief progress report of work interrupted at the outbreak of the war. It was shown that the black coloration appearing in some potatoes after boiling could not be melanin, since the color disappeared rapidly in acid at pH 3.0, at which point melanin is quite stable. Gray coloration partially appeared upon neutralization. The pigment was apparently not associated with tyrosine, since no correlation could be found between the degree of blackening and the tyrosine content of the potatoes or the activity of the enzyme tyrosinase. The pigment developed after heating in alcohol as in water, but in neither case did it appear until oxygen was admitted. Estimation of the iron content of a large number of tubers showed a marked correlation between iron content (as extracted by 20 percent H_2SO_4) and incidence of blackening of the tubers. Most of the iron in the tubers appeared to be extractable and in the ferrous state. Nonblackening tubers could be made to blacken by soaking for some days in 1 percent $FeSO_4$, washing away the excess, and boiling. "Though much remains to be done, it is suggested, as a tentative hypothesis, that in the raw tubers the precursor of the black pigment exists in the form of ferrous iron bound in a loose complex, possibly in combination with proteins. This complex is hydrolyzed on boiling and the iron is then precipitated as a colorless ferrous compound, probably the hydroxide, which is gradually oxidized to the black oxide as air penetrates to the tissues."

Nature of darkening of cooked potatoes, H. W. NUTTING and M. C. PFUND (Cornell Univ.). (*Food Res.*, 7 (1942), No. 1, pp. 48-55, figs. 3).—In the experiments described potatoes were selected from groups that had previously shown a tendency to stem-end blackening upon cooking. The tubers were pared and halved and control halves were boiled for 10 min. in tap water in individual beakers covered with two-holed glass covers, while the other halves were

similarly boiled but in an atmosphere of nitrogen created by bubbling a stream of the gas through the cooking water. After cooking, the water in the beakers was removed by siphoning and the potato halves in their respective atmospheres of air or nitrogen were observed for blackening; the latter were further observed after removal into the air. Other tests, employing an improvised oven and cooling chamber, permitted the baking and subsequent peeling of potatoes in an atmosphere of nitrogen; controls were baked under ordinary conditions in the air.

The potato halves cooked in untreated water showed no blackening during cooking, but after removal to air all but one blackened, the discoloration varying in degree in different tubers but reaching a maximum in less than 1 hr. in all cases, with subsequent fading under certain conditions. Sometimes eye darkening, represented by brownish black particles about the eyes, also occurred, but these particles became apparent early in the cooking. Potatoes cooked in treated water and likewise those baked in an atmosphere of nitrogen showed no blackening during cooking or cooling in the oxygen-free atmosphere, but upon transfer to the air the tubers blackened in all cases, the discoloration reaching maximum intensity in less than 1 hr. In several of these tubers brownish black eye darkening appeared during the boiling process, but was not noticeably intensified after removal to the air.

These results indicated two types of discoloration. The one, the blackening, was a result of oxidation and apparently did not involve tyrosinase, which would have been inactivated during boiling, but probably involved a substance that was either liberated or formed during the cooking process. The other discoloration was the brownish black eye darkening which apparently began even before the potato was cooked and, as judged from the behavior of the pigment, involved melanin. In another series of tests it was shown that blackening was markedly decreased or prevented by the use of cooking waters of pH 4.1-4.9, while it was unchanged or slightly increased by cooking waters of pH 8.4-10. In the former case a tough layer was formed on the outside of the tuber and in the latter there was some surface decomposition and browning.

Nutritive properties of lard and other shortenings. R. HOAGLAND and G. G. SNIDER (*U. S. Dept. Agr., Tech. Bul. 821 (1942), pp. 12*).—The present study, supplementing experiments previously reported (*E. S. R.*, 86, p. 702), was concerned with the nutritive properties of 17 brands of commercial shortenings, which were studied in growth and digestion experiments employing young male albino rats as the test animals. Of these 17 shortenings there were 4 lots of lard, 3 being steam rendered and 1 leaf lard; 8 of vegetable shortening; and 5 of vegetable and animal shortening. In the ability to produce growth there was considerable variation within each of the 3 types of shortening, but the average values of the 3 were very similar. There was no apparent relationship between the growth-promoting value of a shortening and its content of linoleic acid. "The digestibility of lard was superior to that of the other types of shortening. The digestive coefficients for lard ranged from 91.2 for leaf lard to 95.4 for a steam-rendered lard, with an average of 94 percent. The digestive coefficients for vegetable shortening ranged from 84.6 to 91.5, with an average of 87.5 percent. The digestive coefficients for vegetable and animal shortening ranged from 83.5 to 87.0, with an average of 85.6 percent. There was no consistent relationship between the percentage of saturated fat acids in a shortening or its melting point and the digestive coefficient."

Nutritional restoration and fortification of foods (*Indus. and Engin. Chem.*, 33 (1941), No. 6, pp. 707-722, *figs. 2*).—This symposium, held at the 1941 (spring) meeting of the American Chemical Society, consists of the following papers:

Nutritional Requirements of Man, by C. A. Elvehjem (pp. 707-710) (Univ. Wis.); Cereal Products—Vitamin and Mineral Restoration and Fortification from the Viewpoint of the Manufacturer, by R. T. Conner (pp. 711-713); Fortification and Restoration in the Baking and Dairy Industries, by J. A. Tobey and W. H. Cathcart (pp. 714-716); What the Consumer Should Know about Fortified Foods, by H. S. Mitchell (pp. 716-717); Fortification and Restoration of Processed Foods, by R. R. Williams (pp. 718-720); and Control Problems of the National Nutrition Program, by E. M. Nelson (pp. 721-722).

Nutritionally improved or enriched flour and bread (*Jour. Amer. Med. Assoc.*, 116 (1941), No. 26, pp. 2849-2853).—This report of the Council on Foods and Nutrition of the American Medical Association presents a brief survey of the vitamin and mineral (Ca, P, and Fe) composition of wheat, whole-wheat flour, white flour, and nutritionally enriched flours. The bases for the restorative additions of vitamins and minerals to white flour are discussed. The council indicates approval of nutritionally improved flours formulated according to these policies and having a nutritive value equal at least to that represented by the minimum standards for enriched flours proposed by the U. S. Food and Drug Administration (E. S. R., 86, p. 552), providing the product also complies with the rules of the council. Practical methods of obtaining nutritionally improved flours (and breads) and the significance of such products in the diets of adults and children are considered.

High vitamin flours, A. W. ALCOCK and R. K. LARMOUR (*Canad. Chem. and Process Indus.*, 26 (1942), No. 1, pp. 3-9, fig. 1).—This discussion of the production, nutritive value, and commercial utility of high vitamin flours is presented with reference to the Canadian situation. It is indicated that the milling of long-extraction flours would not be the method of choice for the production of high vitamin flours, as these long-extraction flours do not find general consumer acceptance, are unsuitable for many purposes for which high-grade flours are used, have inferior keeping qualities, and would necessitate for their production additional mill equipment involving considerable expense and the use of materials needed for war purposes. In preference to the milling of high vitamin flours, the authors advocate, "as a first step, the addition of enough vitamin by millers or bakers to raise the thiamin content of all flour used in Canada to 4.4 μ g. per gram. They further recommend that studies be instituted to determine whether Canadian dietaries are deficient in nicotinic acid and, if evidence of a deficiency is found, that this vitamin also should be added to flour. . . . Since riboflavin intake is influenced to such a small degree by milling wheat, it is considered that, if this vitamin should ever be added to flour, it should be done under subsidy." No action with respect to pyridoxin and pantothenic acid is recommended for the present.

Nutritive value of dried and dehydrated fruits and vegetables, D. K. TRESSLER (*New York State Sta. Tech. Bul.* 262 (1942), pp. 44).—This bulletin presents "a review of the literature on the effect of commercial drying and dehydrating processes on the nutritive value of fruits and vegetables prepared as a special report from the committee on fats, vegetables, and fruits of the food and nutrition board of the National Research Council, with supplementary tables of the vitamin values compiled by the nutrition section of the [U. S. D. A.] Bureau of Home Economics." General consideration is given to the commercial dehydration processes (sun-drying and dehydration), to specific processes employed in the manufacture of commercially important dried fruits and vegetables, and to the nutritive value of these products. The supplementary tables present data on proximate constituents and mineral and vitamin contents of certain dried fruits and on vitamins (chiefly ascorbic acid) in certain

dehydrated vegetables. It is pointed out that research in the past 25 yr. has indicated the necessity of inactivating the enzymes of vegetables by scalding or by some other means prior to dehydration in order to obtain dehydrated vegetables of good palatability, high vitamin content, and good keeping quality. For retention of vitamin C it has been found necessary to store the dried vegetables in the absence of air. Dehydrated fruits retain vitamins, particularly carotene and vitamin C, much better than those which are sun-dried. Sulfuring of fruits aids in the retention of vitamin C, but causes the almost complete destruction of the vitamin B₁ content.

An extensive bibliography is included.

Processing of fruits and vegetables by canning (*Washington Sta. Bul.* 410 (1941), p. 115).—This is a brief progress report by A. M. Neubert and W. J. Clore (coop. U. S. D. A.) of studies on the adaptability for canning of 30 varieties of yellow freestone peaches and of processing studies on 2 varieties of edible soybeans.

Food preservation prospectus, J. B. HOSMER ET AL. ([*Ga.*] *State Engin. Expt. Sta. Bul.*, 3 (1941), No. 1, pp. 96, figs. 5).—This prospectus presents a discussion of the industrial and agricultural problems of food preservation with a view to making available a complete and accurate picture of the economic and technological conditions affecting the operation of industries that appear to be advantageous to the Southeast, more particularly to Georgia. Canned, frozen, and dehydrated foods are considered with reference to the general phases of marketing, production of suitable raw materials, and the processing operations.

The crux of the canned foods label controversy, Z. I. KERTESZ. [*N. Y. State Expt. Sta.*]. (*Canner*, 94 (1942), No. 8, p. 13).—"Descriptive labeling gives information on the raw material used and about the methods applied in the preparation and preservation of the canned product. The grade, on the other hand, tells one about the canners' skill and success in obtaining good raw material and performing the canning operations. The two systems convey entirely different information which supplement each other but are absolutely not interchangeable." It is pointed out that all of this information is needed for the intelligent purchase of canned foods, that the broker and wholesaler would not think of purchasing without it, and that it is being sought by an increasing proportion of the ultimate purchasers.

Further results of continued administration of propylene glycol, W. VAN WINKLE, JR., and H. W. NEWMAN (*Food Res.*, 6 (1941), No. 5, pp. 509-516).—From prolonged feeding trials with dogs, cats, and rats, the authors conclude that there is no good reason to believe that the internal use of propylene glycol, in such quantities as would likely be present in food, beverages, and vitamin and medicinal products, would present individual or public health hazards. For example, paired feeding of rats in which the diet of the tested rats contained one-fourth the carbohydrate substituted by the caloric equivalent in propylene glycol showed that the glycolized rats grew better than their litter-mate controls and had from two to seven times as much glycogen per gram of liver as the controls.

Food consumption of South Carolina farm families, A. M. MOSER (*South Carolina Sta. Rpt.* 1941, pp. 25-30).—In continuance of the study of home-produced foods and dietary patterns (E. S. R., 85, p. 125), an analysis is presented to show the percentage of the various foods produced at home by farm families with low- and moderate-cost diets as revealed by weekly food records obtained from white farm families in the Piedmont section and the Lower Coastal Plains.

Calcium and phosphorus studies in normal people, including old age, J. D. ROBERTSON (*Lancet* [London], 1941, II, No. 4, pp. 97-99, 100).—Findings

in the study of serum calcium, phosphorus, and phosphatase and the calcium and phosphorus balances of normal adults are presented and compared with observations assembled from the literature. In 60 normal, healthy adults between the ages of 20 and 40 yr. serum calcium averaged 10.4 mg., inorganic phosphorus 3.8 mg., and phosphatase 7.2 units (King and Armstrong) per 100 cc., the respective ranges being from 9.9 to 11.1, from 3.1 to 4.8, and from 3.5 to 13.5. "In 15 healthy people aged 60 to 78, the serum calcium and inorganic phosphorus were not found to be significantly different from those of younger adults. The serum phosphatase was slightly raised in these older people, which may or may not be significant." Calcium and phosphorus balances (33 observations) were determined for 9 normal subjects ranging from 19 to 54 yr. of age. "On a calcium intake of 0.1 gm. daily all subjects were in a negative balance. There was a total calcium excretion of 4.4 mg. and a negative calcium balance of 2.5 mg. per kilogram of body weight daily. On a phosphorus intake of 0.37 gm. daily all subjects were in a negative balance. There was a total phosphorus excretion of 10.4 mg. and a negative phosphorus balance of 3.5 mg. per kilogram of body weight daily. The point at which equilibrium between intake and output of calcium took place was 0.45 gm. daily for a 70-kg. subject." From these results it is concluded that the calcium metabolism of middle age is no different from that of young adults.

Nitrogen, calcium, and phosphorus intakes of college women, M. S. PITTMAN, H. MCKAY, B. L. KUNERTH, M. B. PATTON, N. EDELBLUTE, G. COX, E. SHEFEK, and J. CHEN. (Kans. and Ohio Expt. Stas.). (*Jour. Amer. Dietet. Assoc.*, 17 (1941), No. 10, pp. 947-954).—This report, presented as paper No. 6 of the regional project of the North Central States relating to the nutritional status of college women, deals with the nitrogen intakes of 12 Kansas and 15 Ohio college women and calcium and phosphorus intakes of 12 from Kansas and 4 from Ohio. The subjects ate freely chosen diets over periods varying from 1 to 8 consecutive weeks, during which time the intakes of the several elements were determined from analyses of aliquots of food eaten.

Nitrogen intakes ranged from a daily mean low of 109.1 mg. per kilogram for one Ohio subject to a high of 386.4 mg. for a Kansas subject. Variations in calcium and phosphorus intakes among the different subjects were even greater, ranging from 10.1 to 56.5 and from 11.1 to 51.7 mg. per kilogram, respectively. These differences between subjects were significantly greater, as determined by analysis of variance, than the differences between periods for the same subject. With one exception for nitrogen, the Kansas diets supplied nitrogen, calcium, and phosphorus in amounts above the Sherman standard (70 gm. of protein, 0.68 gm. of calcium, and 1.32 gm. of phosphorus per day per 70 kg. body weight). The 4 Ohio subjects studied for phosphorus had lower intakes of this element than called for in the Sherman standard, and 5 of the 15 subjects for the nitrogen study had a lower protein intake. No subject from either State had a mean calcium intake below the Sherman adult standard.

Further studies on the relationship of the plane of protein intake to the rate of normal calcification during growth, R. T. CONNER, H.-C. KAO, and H. C. SHERMAN (*Jour. Biol. Chem.*, 139 (1941), No. 2, pp. 835-841).—"With rats on a fully adequate diet containing 25 percent of protein in the dry food, increasing the calcium content of the food from 0.61 to 0.77 percent resulted in a slight increase in the percentage of body calcium. When the diet contained 0.61 to 0.64 percent and when it contained 0.77 to 0.80 percent of calcium, it was found that increasing the protein content from 14 to 25 percent of the dry food resulted in an increased rapidity of early growth coincident with a gain in the amount of body calcium. The percentage of body calcium was not consistently affected in the females; in the males the more rapid gain in body

weight induced by the higher protein intake resulted in a retardation of the normal increase in percentage of body calcium, which, however, was essentially the same in the adults regardless of whether they had received 14, 18, or 25 percent of protein. There was no consistent evidence in either sex that the increased gain in body weight which resulted from the higher of the protein levels here studied had any accelerating effect upon skeletal development as reflected in the percentage of body calcium." The experiments here reported continue work previously published (E. S. R., 78, p. 277).

Influence of protein intake upon growth, reproduction, and longevity studied at different calcium levels, H.-C. KAO, R. T. CONNER, and H. C. SHERMAN (*Jour. Nutr.*, 22 (1941), No. 3, pp. 327-331).—This paper completes the series of reports (see above study) on the effect of simultaneous increases of the protein and calcium intake upon the nutritional well-being of rats on a diet already adequate but suboptimal in calcium and perhaps also in protein, riboflavin, and vitamin A. The increase in protein from 14.4- to 18.8- and 25-percent levels tended to increase growth of the rat up to about 60 days of age. This was found for both sexes and for both the basal diets used, containing, respectively, from 0.61 to 0.64 and 0.77 to 0.81 percent of calcium (dry matter basis).

"At 6 mo. and at 1 yr. of age the rats which had received diets with 18.8 and 25 percent of protein, respectively, were of essentially the same size, and slightly larger than those which received the diet with 14.4 percent protein. With the higher protein intakes, maturity appeared to be reached slightly earlier as judged by the age of the females at birth of first young. The average numbers of young born and the young reared, per female, were essentially the same on the diets of 18.8 and 25 percent protein, respectively. The duration of the reproductive life was also essentially the same on the different protein levels here studied. The higher levels of protein resulted in slightly higher average weight of young at 28 days of age. With each sex and with each calcium level, the average length of life was essentially the same on the different protein levels here studied."

The requirement for calcium (*Jour. Amer. Med. Assoc.*, 117 (1941), No. 21, p. 1786).—In this editorial the research of Steggerda and Mitchell and Outhouse et al. (E. S. R., 80, p. 417) is reviewed briefly, with the comment that these studies "will be of value in long range planning of dietaries and in securing greater insight into the problems of mineral metabolism."

The influence of dietary fibre on secretory activities of the alimentary tract: Observations on faecal phosphatase excretion and calcium and nitrogen balances of rats, J. DUCKWORTH and W. J. GODDEN (*Biochem. Jour.*, 35 (1941), No. 1-2, pp. 16-23).—Calcium and nitrogen balances were determined in rats receiving a low fiber basal diet in the control period and this diet plus 10, 20, 30, and 40 percent of paper pulp in successive test periods. Diet failure at the 40-percent level abruptly terminated this test, but results at the other levels showed that increasing the fiber content of the diet of rats up to 30 percent had no influence on calcium retention but reduced the nitrogen balance. Large increases in fecal phosphatase excretion were observed when the fiber intake was raised. This was thought to indicate increased secretory activity within the intestines. "The absence of any depressing effect of large increases in the intestinal secretions on the Ca balance was considered to indicate that the reabsorption of secreted Ca is highly efficient."

Bibliography on metals in foods and biological materials.—[IV], **Manganese,** E. B. D[AW] (*Analyst*, 66 (1941), No. 782, pp. 196-202).—This supplements the series noted earlier (E. S. R., 69, p. 752), bringing the bibliography to date.

The relative assimilation of fluorine from fluorine-bearing minerals and food (tea), and from water and food, M. LAWRENZ and H. H. MITCHELL. (Univ. Ill.). (*Jour. Nutr.*, 22 (1941), No. 6, pp. 621-631).—In continuation of studies relating to the assimilation of fluorine (E. S. R., 86, pp. 126, 559), comparisons were made by controlled feeding experiments on 22 trio groups of growing rats of the retention of dietary fluorine from different sources. One test involved a comparison of calcium fluoride and sodium fluoride administered in water solution and sodium fluoride administered in food, each at the level of 9 p. m. of fluorine. When fluorine was given in the water, the consumptions of water and of the basal ration were separated in time as much as possible in order to minimize any influence of the food on the assimilability. As judged by data on the fluorine content of bones, teeth, and soft tissues of the animals, the fluorine in sodium fluoride was no more assimilable than that in calcium fluoride, but definitely more assimilable (5 percent) than that in green tea, which in turn was probably somewhat more assimilable than the fluorine in rock phosphate. The fluorine of sodium fluoride administered in the drinking water was 21 percent more completely assimilated than the fluorine of the same compound consumed in the same amounts in food. It is pointed out that previous tests with cryolite as a source of fluorine had shown a 20 percent depression in assimilation due to admixture with food.

Biological symposia, V, edited by J. CATTELL (*Lancaster, Pa.: Jaques Cattell Press, 1941, vol. 5, pp. IX+247, figs. [231]*).—The material in this volume (E. S. R., 83, p. 753), edited by H. B. Lewis, is concerned with the more strictly chemical aspects of biology and comprises the four symposia arranged by the council of the American Society of Biological Chemists for the meeting of the Federation in April 1941. The subjects presented in Symposium I, Comparative Biochemistry, include End Products of Nitrogen Metabolism in Plants, by H. B. Vickery (pp. 3-19); End Products of Nitrogen Metabolism in Animals, by H. B. Lewis (pp. 20-30); and The Merging of Growth Factors and Vitamins, by W. H. Peterson (pp. 31-43) (Univ. Wis.). Symposium II on the Intermediate Metabolism of Fats includes The Oxidation of Branched-Chain Fatty Acids, by H. E. Carter (pp. 47-63) (Univ. Ill.); The Origin and Regulation of Ketone Bodies From Fats, by S. Soskin and R. Levine (pp. 64-81); The Anabolism and Function of the Phospholipids, by R. G. Sinclair (pp. 82-98); and The Formation of Animal Body Fat, by H. E. Longenecker (pp. 99-115). Symposium III on Carbohydrate Metabolism includes Oxidation Catalysts, by T. R. Hogness (pp. 119-130); Phosphorylation of Glycogen and Glucose, by C. F. Cori (pp. 131-140); Oxidoreductions in Carbohydrate Breakdown, by O. Meyerhof (pp. 141-156); and Pyruvate Oxidation and the Citric Acid Cycle, by E. A. Evans, Jr. (pp. 157-173). Symposium IV on the Biochemistry of Choline includes Choline, the B Vitamins and Fat Metabolism, by E. W. McHenry (pp. 177-192); The Relation of Choline to the Kidneys, by W. H. Griffith (pp. 193-212); The Nature and Significance of Cholinesterase, by D. Glick (pp. 213-233); and Interrelationships Between Choline and Other Methylated Compounds, by V. du Vigneaud (pp. 234-247) (Cornell Univ.).

Blood: Review of recent literature, S. M. GOLDHAMER, C. C. STURGIS, and F. H. BETHELL (*Arch. Int. Med.*, 67 (1941), No. 6, pp. 1177-1285).—This extensive review, based very largely on studies reported in 1940 (E. S. R., 85, p. 694), considers the following phases of the subject: Pernicious anemia, macrocytic anemias other than pernicious anemia, microcytic anemias, anemia in pregnancy, hemolytic anemia, erythroblastic and related anemias, Banti's syndrome, polycythemia vera, blood coagulation, agranulocytosis, infectious mononucleosis, Hodgkin's disease, lymphosarcoma and lymphomatoid diseases, leukemia, and bone marrow.

Etiology of the anemias, C. C. STURGIS (*Amer. Jour. Pub. Health*, 31 (1941), No. 1, pp. 10-20).—A review, dealing particularly with the etiological factors of the various anemias considered at length in the above review.

Hemoglobin and vitamin content of blood of school children, E. J. LEASE, J. H. MITCHELL, and A. M. MOSFEE (*South Carolina Sta. Rpt. 1941*, p. 77).—The effect of the school lunch on the nutritional condition and educational progress of elementary school children was studied in two rural schools in one of which a well-balanced school lunch, and in the other no lunch, was served. Hemoglobin values and the levels of ascorbic acid, blood carotene, and vitamin A are discussed.

The effect of copper and iron on hemoglobin regeneration, W. M. FOWLER and A. P. BARER (*Jour. Lab. and Clin. Med.*, 26 (1941), No. 5, pp. 832-836).—In 20 patients with mild grades of hypochromic anemia, medication for 42 days with daily doses of iron and ammonium citrates furnishing 85 mg. of elemental iron failed to produce satisfactory gains in hemoglobin. The addition of copper sulfate to the extent of giving an iron:copper ratio of 28:1 did not increase the effectiveness of this small amount of iron. When the iron dosage was increased to 170 mg., the response of the patients to iron medication alone was greater than that obtained with half the amount of iron plus the copper sulfate, thus indicating that the patients still had the ability to respond when iron was available in sufficient amounts.

Effect of processing on carotenoid (provitamin A) content of peaches, D. DEFELICE. (U. S. D. A. coop. N. Y. State Expt. Sta.). (*Food Res.*, 7 (1942), No. 1, pp. 16-25).—Mature tree-ripened peaches grown in and around Geneva, N. Y., were used in this study of the relative carotenoid content of fresh peaches, frozen sliced peaches, frozen peach pulps, and peach juices variously prepared. Carotenoids were determined by the method of Zimmerman et al. (*E. S. R.*, 85, p. 564), the procedure being extended to include adsorption on MgO in a Tswett column. Readings before and after adsorption were interpreted as total carotenoids and β -carotene, respectively, and the difference as due to α - and γ -carotene and cryptoxanthin. In calculating vitamin A activity these latter pigments were reckoned as having half the activity of β -carotene, 1 γ of which was considered equivalent to 1.4 International Units of vitamin A. Calculated on this basis, vitamin A values obtained by chemical evaluation agreed within the limits of experimental error with animal bio-assay values in determinations on frozen pulps from five varieties of peaches. By chemical determination, these varieties, Rochester, Elberta, J. H. Hale, South Haven, and Crawford, were found to contain 13.2, 13.2, 12.8, 11.8, and 19.3 I. U. of vitamin A per gram of the frozen pulp and 16.7, 14.1, 12.5, 12.3, and 19.3 I. U. per gram of the fresh pulp; values for fresh and frozen sliced peaches, although slightly higher than those for the pulps, showed likewise that the frozen product contained approximately 75 percent of the vitamin A potentially available in the whole fresh peach. The frozen pulps had essentially the same vitamin A content after 6 months' storage at -23° C. as they had when first frozen.

Studies of frozen pulps from 17 varieties of peaches sweetened with various proportions of sucrose showed no significant variation in retention of the vitamin A potency over a storage period of 6 mo. at -23° . The sucrose apparently exerted no protective action at this low temperature. "Pressing of peaches for juice resulted in losses of approximately 50 percent of the carotenoids possessing vitamin A activity, while centrifuging of these peach juices resulted in additional losses of vitamin A precursors up to 30 percent. The deaeration and pasteurization processes as such showed no special effect on the retention of provitamin A content. Pulpy juices prepared by cold-pulp extraction, diluted

with a sugar sirup, and deaerated gave a commercially feasible juice, although low in provitamin A."

Possible adaptation to a low vitamin B₁ intake, F. M. MEYERS (*Amer. Jour. Med. Sci.*, 201 (1941), No. 6, pp. 785-789).—A small number of healthy Javanese subjects were found to have very low thiamin excretion (determined by the thiochrome method), the 24-hr. values ranging from 0 to 63 μ g. In spite of these low levels, the percentages excreted of the test doses of 2-4 mg. administered subcutaneously compared favorably with those reported in the literature, ranging from 2 to 50 percent and with the majority between 10 and 80 percent. Inasmuch as present dietary habits of many races in the Netherlands East Indies make a low vitamin B₁ intake probable, it is suggested that a chronic low vitamin B₁ intake results in an adaptation of the body to low intakes.

Requirement of the mouse for pantothenic acid and for a new factor of the vitamin B complex, J. G. SANDZA and L. R. CERECEDO (*Jour. Nutr.*, 21 (1941), No. 6, pp. 609-615, figs. 2).—With the basal diet used in this study, the B vitamins other than pantothenic acid were given as riboflavin, thiamin chloride, vitamin B₆ hydrochloride, and an alcohol-soluble liver extract heated with alkali to destroy pantothenic acid. When mice on the basal diet with these additions were injected subcutaneously with graded doses of *d*-calcium pantothenate in water solution, increased growth resulted with increased dosage up to 30 μ g. daily, with no further growth at 40 μ g. Controls receiving no pantothenic acid ceased to grow in a few days, showed symptoms of filtrate factor deficiency in from 20 to 30 days, and finally lost weight and died on about the fifty-fifth day. Inasmuch as animals receiving untreated liver extract grew better and appeared to be in better condition than those receiving the alkali-treated liver extract plus pantothenic acid, it was concluded that in addition to thiamin, riboflavin, and vitamin B₆ two additional factors are necessary for normal growth in the mouse. One of these is pantothenic acid, the requirement of which appears to be about 30 μ g. daily as *d*-calcium pantothenate. The other factor, which may be identical with Elvehjem's factor W, is alkali-stable and is present in liver extract.

Urinary excretion of pantothenic acid by normal individuals, L. D. and E. Q. WRIGHT. (W. Va. Univ.). (*Soc. Expt. Biol. and Med. Proc.*, 49 (1942), No. 1, pp. 80-81).—Pantothenic acid was determined by the method of Pennington et al. (*E. S. R.*, 85, p. 442) in 57 24-hr. urine specimens from 29 normal individuals. "In 72 percent of the cases studied the daily excretion fell between 2.50 and 4.00 mg. per day. The mean daily excretion of pantothenic acid was 3.42 mg. (maximum 5.54 mg.; minimum 1.10 mg.)."

Riboflavin contents of tissues as stabilized in the adult at liberal levels of intake, F. O. VAN DUYN and H. C. SHERMAN (*Natl. Acad. Sci. Proc.*, 27 (1941), No. 6, pp. 289-291).—Examined by the *in vitro* method previously noted (*E. S. R.*, 86, p. 587), tissues of rats reared on food containing 5 and 20 μ g., respectively, of riboflavin per gram contained the following quantities of riboflavin per gram of fresh tissue: Liver 39.6 ± 0.35 and 40.8 ± 0.60 μ g., kidney 34.8 ± 0.76 and 33.6 ± 0.79 , and heart 27.2 ± 0.47 and 26.6 ± 0.64 μ g. *In vitro* measurements for skeletal muscle proved rather unsatisfactory because of a slightly different color fluorescence, but values obtained by bio-assay were 3.9 ± 0.29 and 3.4 ± 0.30 μ g. per gram. The fact that the fourfold increase in riboflavin content of the diet did not give an increase in the riboflavin content of the tissues indicated that the lower level was sufficient to meet the tissue needs for this vitamin. However, the young of the animals on the higher level had greater vitality than those on the lower level, leading the authors to conclude that "when tissue content of riboflavin has reached its 'plateau' and

does not rise appreciably further in response to still higher levels of intake, such higher intakes may nevertheless improve the body's internal environment in some other way, thus giving rise to more vigorous offspring."

The xanthine oxidase content of rat liver in riboflavin deficiency, A. E. AXELROD and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 140 (1941), No. 3, pp. 725-738, figs. 2).—A method for the manometric determination of the xanthine oxidase activity of rat liver is described, and data are reported on such activity during riboflavin deficiency and therapy. The data presented "indicate clearly that the xanthine oxidase activity of rat liver is considerably diminished in riboflavin deficiency. The available evidence points to the fact that this decreased activity is not due to the presence of inhibiting substances but rather that it represents a true deficiency in xanthine oxidase content. Under the correct experimental conditions the xanthine oxidase content can be restored to its normal value by riboflavin therapy. This may be taken as presumptive evidence for the fact that some essential component of xanthine oxidase is related structurally to riboflavin."

Dermatitis in pyridoxine-deficient rats, S. LEPKOVSKY and M. E. KRAUSE. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 49 (1942), No. 1, pp. 57-58).—Previous experience showed that a large proportion of rats failed to develop dermatitis when placed at 21 days of age, without any depletion period, on the pyridoxin-deficient diet (R. S. R., 76, p. 839) supplemented with thiamin, riboflavin, and factor 2 concentrates. Present tests and previous experience showed, however, that dermatitis did develop in a large proportion of the rats when placed for a depletion period of from 10 to 12 days on the riboflavin-deficient diet alone, followed by a 2-week period with thiamin and riboflavin supplements (at which time the symptoms of dermatitis began to appear), and then a period with the further addition of factor 2 concentrates. After 5 weeks on this regime, only 4 out of 40 rats remained without dermatitis. It thus appeared that dermatitis developed as a result of factor 2 deficiency superimposed upon pyridoxin deficiency, and that the effects of such an extra deficiency seemed to carry over, with respect to dermatitis, even after the addition of factor 2 concentrates so that only a pyridoxin deficiency remained. "The question may well be raised whether dermatitis or acrodynia is a reliable expression of uncomplicated pyridoxin deficiency."

Comparative costs of vitamin C in fresh and commercially canned fruit and vegetable juices, A. D. HOLMES, M. G. PIGOTT, and F. TRIPP (*New England Jour. Med.*, 225 (1941), No. 2, pp. 68-73).—Vitamin C was determined by 2,6-dichlorobenzenoneindophenol titration of freshly extracted and commercially canned juices. The citrus fruits used were bought on the open market (Boston) and included five Florida, one California, and several unidentified brands of oranges; Florida and Texas grapefruit; and California lemons. A summary of the analytical and cost data presented for the individual samples of fresh and canned juices showed that the average amounts of vitamin C per 100 cc. amounted to 48 mg. for the fresh grapefruit juice (43 mg. for Florida fruits and 60 mg. for Texas), 47 mg. for fresh lemon juice, 45 mg. for fresh orange juice (52 mg. for Florida oranges, 43 mg. for California oranges, and 41 mg. for fruits of unknown origin), 41 mg. for canned orange juice, 36 mg. for canned lemon juice, 31 mg. for canned grapefruit juice, 14 mg. for canned tomato juice, and 9 mg. for canned pineapple juice. "The average amounts of juices required to supply 50 mg. of vitamin C, arranged in ascending order, are as follows: 106 cc. of fresh grapefruit juice, 107 cc. of fresh lemon juice, 116 cc. of fresh orange juice, 125 cc. of canned orange juice, 151 cc. of canned lemon juice, 167 cc. of canned grapefruit juice, 368 cc. of canned tomato juice, and 568 cc. of canned

pineapple juice. . . . The average cost of 50 mg. of vitamin C from the various sources under consideration was found to be 2.7 ct. for canned orange juice, 3.1 ct. for canned grapefruit juice, 3.7 ct. for fresh orange juice, 4.6 ct. for fresh grapefruit juice, 6.3 ct. for canned tomato juice, 7.0 ct. for fresh lemon juice, 8.6 ct. for canned lemon juice, and 13.0 ct. for canned pineapple juice." Miscellaneous juices, including canned papaya nectar, lime juice, apricot nectar, apple juice, and cranberry juice, contained low or even negligible amounts of vitamin C.

Determinacion de la vitamina C por titulacion indofenolica en algunas frutas y legumbres costarricenses [Vitamin C determination by indophenol titration in some Costa Rican fruits and vegetables], R. COTO FERNÁNDEZ and M. FAIRÉN A. (*Salud* [Costa Rica], 3 (1940), No. 1-12, pp. 46-51, fig. 1).—The edible portion of sound ripe samples of a number of fruits and vegetables were analyzed for vitamin C by the Bessey and King method. No scientific names are given for identification.

Der Vitamin C-Gehalt der Paprikafrüchte und ihre Bedeutung als Schutz-nahrungsmittel für die Volksernährung [The vitamin C content of paprika fruits and their significance as a protective foodstuff], B. VAJIC (*Ztschr. Vitaminforsch.*, 11 (1941), No. 1, pp. 42-56; *Fr. abs.*, p. 56).—Analyses over three seasons showed the ascorbic acid content of fresh peppers of all varieties available for food in Yugoslavia to vary from 46.2 to 489.6 mg. percent. The lowest vitamin C values occurred at the beginning of growth (May to June), while later there was a sharp increase, with the highest values being reached in the fall. The red ripe fruits had on an average a higher vitamin C content than the green fruits, a difference which was also observed between red and green portions of individual fruits that had ripened unevenly.

Ascorbic acid (vitamin C) content of garden-type peas preserved by the frozen-pack method, E. N. TODHUNTER and R. C. ROBBINS (*Washington Sta. Bul.* 408 (1941), pp. 28).—Ascorbic acid was determined by a modification (described) of the titration method of Bessey and King (*E. S. R.*, 71, p. 137). In some samples handled under conditions that might have permitted enzyme action and oxidative changes, dehydroascorbic acid was determined. Peas of the Tall Alderman or Thomas Laxton varieties were used. These were grown at the Western Washington Experiment Station, Puyallup, and were processed and frozen at the U. S. D. A. Frozen Pack Laboratory, Seattle. The peas were frozen and hermetically sealed in No. 2 cans and stored at about 0° F. The commercial samples of frozen peas included several varieties. The individual studies are discussed in some detail, the data are tabulated, and the results are summarized as follows:

"Ascorbic acid was lost from peas which had been removed from the pod and allowed to stand at room temperature for 8 hr. or more before freezing. Peas that had been scalded showed rapid loss of ascorbic acid by solution. From the point of view of retention of ascorbic acid, it is preferable to scald in steam and to cool immediately by a blast of cold air, rather than to immerse in water. The process of scalding peas in boiling water for 1 min. and cooling in water causes a loss of 30 to 37 percent of the ascorbic acid present in the fresh raw peas. After freezing no further loss was observed in peas stored for 11 mo. at -17.8° C. (0° F.). Samples of peas commercially packed, as available on the market to the consumer, contained from 0.12 to 0.23 mg. ascorbic acid per gram of frozen peas. Frozen peas after cooking retained important amounts, 40 to 50 percent, of the ascorbic acid present in the original fresh raw peas. The process of scalding and preparing for freezing destroyed 30 percent, and cooking 10 to 20 percent. Cooking caused little or no actual destruction of the

vitamin, but some ascorbic acid was dissolved in the cooking water. Fresh peas were somewhat higher in ascorbic acid, since they had not undergone the scalding and freezing process. Peas cooked in a nonleach steamer retained a higher percentage of the original ascorbic acid than those cooked in boiling water. Increasing the amount of the cooking water increased the solubility losses of ascorbic acid."

Tables are appended summarizing data as obtained by different workers concerning the ascorbic acid content of raw peas (fresh and frozen), canned peas, and frozen peas.

Fortsatta C-vitaminundersökningar på potatis (Further vitamin C studies in potatoes), O. TEDIN (*Sveriges Utsädesför. Tidskr.*, 51 (1941), No. 4, pp. 238-255; *Eng. abs.*, pp. 253-254).—Individual tubers of one variety grown in two places in Sweden were divided lengthwise, one-half being analyzed raw and the other after steaming (15-20 min.). In each case the outer and inner layers were analyzed separately, and ascorbic acid was determined, by indophenol titration, before and after reduction with H_2S . The data, tabulated and analyzed for statistical significance, indicated that there was little or no dehydroascorbic acid in the boiled material, while a considerable amount was present in the raw material, the outer part containing about twice as much as the inner part. Total ascorbic acid was about 1 mg. percent higher in the inner portion than in the outer portion of either the raw or cooked samples, and the content of the cooked samples was about 1 mg. percent lower than that of the corresponding inner or outer portions of the raw samples. In cooking tests the peeled samples showed greater cooking losses than did the unpeeled tubers, and steaming resulted in greater losses than did boiling. The results also indicated that the vitamin losses upon boiling were less in samples started in cold water than in those put into boiling water.

Average vitamin C values are reported for a large number of varieties. It is pointed out, however, that for a given variety there are regional differences and moreover that individual tubers from one small plot vary considerably in their ascorbic acid content, with differences amounting to 20 percent (or more) of the total content. Generalizations from this particular study suggest that the vitamin C is higher in potatoes from south Sweden than in those of the same variety from stations further north. In some cases one and the same variety has either a high or a low content in all places where it is tested, while in other cases a given variety may have comparatively low values in some places and high ones in others.

Vitamin C im Sauerkraut und seine Veränderungen während des Lagerens [Vitamin C in sauerkraut and changes during storage], B. VAJIC (*Ztschr. Vitaminforsch.*, 11 (1941), No. 1, pp. 29-42; *Fr. abs.*, p. 42).—Analyses of sauerkraut, obtained from each of four dealers (in Yugoslavia) at intervals during the season in several years, showed some samples to contain as high as from 35 to 45 or 50 mg. percent (approximate) of ascorbic acid, while others contained practically none (2-3 mg. percent). The variations in ascorbic acid content were erratic, even in samples taken from time to time from any one container, and appeared to be associated with sampling. Samples taken from the top layer that had been in contact with the air were lower in ascorbic acid than samples taken from lower unexposed layers. In these lower layers there appeared to be only a slight decrease in the vitamin C content during storage over most of the season. Toward the end of the season there was a decided drop in the ascorbic acid content. Juice obtained by pressing the sauerkraut contained about the same quantity of ascorbic acid (in milligrams per 100 cc.) as did

the sauerkraut itself, indicating a fairly uniform distribution of the ascorbic acid between sauerkraut and brine.

Ascorbic acid absorption in infantile diarrhea, A. F. ABT and C. J. FARMER (*Jour. Ped.*, 18 (1941), No. 6, pp. 756-763, figs. 4).—In this detailed report of a study noted essentially from a preliminary report (E. S. R., 84, p. 566), charts are presented showing the content of ascorbic acid in the feces, 24-hr. urinary excretion, and blood plasma in three children from 2 to 3 mo. of age suffering from a nonspecific type of acute diarrhea and given 200 mg. of ascorbic acid daily for 3 days.

During the acute stage of the diarrhea there was a considerable increase in the fecal excretion of ascorbic acid, and the blood plasma values and urinary excretion remained low in spite of the large intakes of ascorbic acid. In one infant in whom the diarrhea was completely checked there was a rapid decrease in fecal ascorbic acid, an increase in urinary excretion, and a slight increase in plasma ascorbic acid.

It is pointed out that while failure to absorb ascorbic acid administered orally during diarrhea in infancy would not be clinically significant in acute diarrhea of short duration, in protracted or chronic diarrhea it would indicate the need for the parenteral administration of ascorbic acid as a protection against the development of scurvy. It is emphasized that the young, rapidly growing infant or child has a greater need for, or higher metabolism of vitamin C than the adult whose metabolism is at a generally lower rate not requiring the extra demands of growth. However, following a long period on a vitamin C-free diet clinical scurvy eventually results, as demonstrated by Crandon et al. (E. S. R., 86, p. 871), and may be initiated by a superimposed diarrhea or infection.

Influence of vitamin D upon the incisor teeth of rachitic rats, J. T. IRVING (*Nature [London]*, 147 (1941), No. 3733, pp. 608-609, figs. 2).—In this preliminary report it is noted that longitudinal sections of upper incisor teeth of rats on a vitamin D-free diet for 31 days showed in the dentine changes usually found in this condition, i. e., very wide predentine with vascular inclusions in several places. Similar sections of teeth of rats on the avitaminous diet for 31 days and which received 9.2 International Units of vitamin D on the twenty-first day showed a different appearance from that of the controls. The changes involved the appearance of a reactive strip of new dentine, staining deeply with hematoxylin, laid down as a result of vitamin medication. This intense calcification affected only the dentine matrix laid down after the vitamin had been given, the predentine laid down previous to this remaining unchanged or else showing only a few calcified granules. It was estimated that the vitamin D had been acting on the various teeth examined from 4.2 to 6.5 days. The depth of staining of the new dentine indicated that after 10 days the vitamin D administered was still exerting a marked action.

The economical purchase of vitamin-D preparations, J. E. BECKER (*U. S. Dept. Labor, Children's Bur., Child*, 5 (1941), No. 10, pp. 244-249).—This practical discussion concerns the kinds of vitamin D preparations available, their potency, and their relative cost. These preparations for oral use include fish-liver oils, enriched and fortified fish-liver oils, concentrates of fish-liver oils, activated ergosterol and 7-dehydrocholesterol, and vitamin D milks. It is pointed out that the war has seriously affected the shipment of cod-liver oil and other fish-liver oils so that a relative scarcity exists and prices have increased, but that other sources of vitamin D of equal effectiveness and greater concentration are available. A survey of different products showed a wide range of potencies. Cod-liver oils, for example, contained at least 100 units of vitamin D per gram, and many contained from two to four times this much, while viosterol

and certain enriched and fortified fish-liver oils contained as much as 10,000 units per gram. On the basis of unitage and retail prices of 14 products available from one manufacturer, it was calculated that the amounts of the several products required to furnish 800 units of vitamin D varied from 0.3 to 7.4 ct. The following suggestions are made as a basis for selecting a source of vitamin D:

"(1) Buy only products that have their potency in U. S. P. units of vitamin D recorded on the label, so that the amount containing the desired dosage and the cost per dose may be calculated. (2) Determine the daily intake on the basis of the vitamin D units desired and disregard the dosage suggested on the label. It is often too high. (3) Buy preparations containing only vitamins A and D rather than mixtures of the 'gun shot' type. (4) Buy the size of container that can be used to best advantage."

Vitamin K, H. R. BUTT and A. M. SNEEL (*Philadelphia and London: W. B. Saunders Co., 1941, pp. X+172, figs. 39*).—This monograph sets forth the history of vitamin K and the essential facts in respect to its chemistry and physiologic activity, and presents data considered of value with respect to the clinical use of the vitamin. A fairly complete bibliography (350 references) is appended.

Vitamin K, E. A. DOISY, S. B. BINKLEY, and S. A. THAYER (*Chem. Rev., 28 (1941), No. 3, pp. 477-517, figs. 2*).—This review gives consideration to the discovery of vitamin K; bio-assay of antihemorrhagic compounds; occurrence and distribution of antihemorrhagic substances; isolation, constitution, and synthesis of vitamin K; physical and chemical properties of the natural vitamins; simple 1,4-naphthoquinones and related compounds; and clinical work with antihemorrhagic compounds.

The prothrombin concentration in the blood of various species, A. J. QUICK (*Amer. Jour. Physiol., 132 (1941), No. 1, pp. 239-244, fig. 1*).—"By means of the method developed by the writer for the quantitative determination of prothrombin, it has been found that the concentration of this factor varies greatly in different species. If the prothrombin level of normal rabbit plasma is set at 100, the concentration found in various species is as follows: Dog 100, cat 60, lion 60, horse 40, man 20, cow 16. The probable reason why the two-stage method of Smith for the determination of prothrombin fails to show this marked variation in prothrombin content of various bloods is discussed."

Prothrombin in the newborn infant, II, III, S. KOVE and II. SIEGEL (*Jour. Ped., 18 (1941), No. 6, pp. 764-775, figs. 5*).—In continuation of this series (*E. S. R., 86, p. 280*) two papers are presented.

II. Prothrombin response to water-soluble naphthoquinone administered intravenously (pp. 764-770).—Studies upon a large number of newborn infants indicated the presence of prothrombin deficiency in varying degrees in a large percentage of them. In none, however, was there any evidence of hemorrhagic diathesis, thus indicating that a prothrombin deficiency in itself is not sufficient to precipitate hemorrhagic disease of the newborn infant. Four newborn infants chosen as representative of the various degrees of severity of prothrombin deficiency were given 1 mg. of 2-methyl-1,4-naphthoquinone administered intravenously as the water-soluble 3-sodium sulfonate. After latent periods varying from $\frac{1}{2}$ to 2 hr. there was a definite prothrombin response in all cases, those having initial high clotting time showing first a precipitous drop in prothrombin clotting time. Following the initial response, cases with moderate hypoprothrombinemia reached the normal level in about 8 hr., whereas the two cases with severe prothrombin deficiency still showed moderate hypoprothrombinemia at the end of this time.

III. On the nature of prothrombin in the newborn infant (pp. 770-774).—Graphs showing prothrombin clotting times of serial dilutions of plasma of normal adults were compared with those of newborn infants under various

conditions. The curves for infants with normal prothrombin levels, for infants showing varying degrees of prothrombin deficiency, and for one newborn infant whose prothrombin was produced as a result of naphthoquinone therapy were all similar to the adult curve. These similarities are considered as presumptive evidence that the prothrombin of the newborn infant is qualitatively similar to that of the normal adult regardless of concentration or source. Transfusion as an adjunct to vitamin K therapy was recommended in certain types of cases of hemorrhagic disease of the newborn.

Spectrochemical studies of potassium in bone and tooth substance, L. T. STEADMAN, H. C. HODGE, and H. W. HOEN (*Jour. Biol. Chem.*, 140 (1941), No. 1, pp. 71-76, figs. 2).—Preliminary study showed that increasing amounts of calcium salts, such as phosphates, increased the amounts of potassium needed to give detectable lines in the spectra. In order to estimate more accurately the potassium content of the enamel, allowance was made for this effect of calcium, and a series of enamel preparations was made in which the relative amount of calcium phosphate was increased until no evidence of potassium contributed by the enamel could be detected. In this way it was estimated that about 0.3 percent of potassium occurs in enamel. The enamel seemed to contain somewhat more potassium than did the dentin, and this in turn somewhat more than bone.

Dietary repair of experimental caries, R. F. SOGNAES (*Science*, 93 (1941), No. 2426, p. 617).—Experimental caries was produced by feeding rats a coarse corn caries-producing diet for 100 days. Continuance of animals beyond the 100 days for an additional 2 mo. on an adequate stock diet of finely ground fox chow stopped the caries process and left the exposed dentin hard and polished. Gross microscopic and histological examination of the teeth of the animals sacrificed for study showed that a thick layer of secondary dentin had been laid down. "This experimental approach, which permits histological evaluation of the reparative processes associated with carious disintegration, should offer a new field of investigation of the dietary and other factors involved in the control of dental caries."

Further studies on methods of removing brown stain from mottled teeth, H. V. SMITH and J. W. MCINNES (Univ. Ariz.). (*Jour. Amer. Dent. Assoc.*, 29 (1942), No. 4, pp. 571-576, figs. 3).—Excised mottled teeth, the roots of which were coated with paraffin, were immersed in dental stain removers containing hydrochloric acid as the active constituent. The loss of enamel, as measured by loss in weight and decrease in diameter of the tooth, was appreciable and increased with the time of immersion and decreased with dilution of the stain remover. These results indicated that corrosive acids should not be used to remove stain from teeth except where stain is superficial, and that the acid, if used, should be neutralized almost immediately after application. When applied by the method described, superoxol, stabilized 80 percent H_2O_2 , was found to be effective in removing the brown stain from mottled teeth of human subjects who volunteered for the trials. Because of the caustic nature of the superoxol and the necessity of applying heat during the treatment, which involves some discomfort, the treatment should be given only by a dentist.

TEXTILES AND CLOTHING

Application of rank correlation to the development of testing methods, E. R. SCHWARZ and K. R. FOX (*Textile Res.*, 11 (1941), No. 12, pp. 482-489).—The Kendall rank correlation and concordance coefficient technics are outlined briefly, and examples are given of their application in the statistical handling of nondimensional qualitative results of textile tests. It is pointed out that these

methods make it possible to evaluate the true significance of such results, but that the statistical treatment must be preceded by rigid experimental design to contribute the greatest value to the testing procedure.

Methods and practice of fiber identification, J. M. PRESTON (*Amer. Dyestuff Rptr.*, 31 (1942), No. 7, pp. 149-150, 169-170).—This address discusses the sort of information that may or may not be obtained about fibers by consideration of the following factors: Arrangement, size, shape, fine structure of fibers, substances of which they are composed, and characteristic impurities or auxiliary substances. In practical identification, appearance and feel, the burning test, application of a stain, and sectioning by the plate method, with gross or microscopic observation of the sections, are suggested as preliminary tests requiring little time, yet yielding sufficient information to tell in general what fibers are present. Reference is made to several schemes of identification useful for further examination.

Growing use of the synthetics calls for new methods of fiber identification (*Textile Res.*, 12 (1941), No. 2, pp. 25-29, figs. 8).—The scheme presented for identification of synthetic fibers (Fiberglas, soybean fiber, casein fiber, Nylon, Vinyon, and acetate, viscose, and cuprammonium rayons) has been compiled from various sources. It involves microscopic examination of the sample to ascertain that it is not composed of cotton, wool, silk, asbestos, or other natural fibers, followed by tests, briefly described, involving behavior upon burning and upon treatment with certain chemical reagents. Photomicrographs showing longitudinal and cross-sectional appearance of the synthetic fibers are presented.

Sulphuric acid carbonization method adapted for mixed-fabric analysis (*Textile Res.*, 12 (1941), No. 1, pp. 14-16).—The method, described in detail, consists essentially of treating about 2 gm. of the dried, degreased sample with 100 times its weight of boiling 1 percent sulfuric acid for from 7 to 10 min., followed by drying and shredding of the sample and subsequent treatment with 200 cc. of 70 percent sulfuric acid at 100° F. After standing for 15 min. with frequent stirring, the acid is diluted and the residue, recovered by filtration with suction, is washed, neutralized, again washed, and finally dried and weighed. For routine tests the average of results obtained by analysis of two or three samples is considered sufficiently precise. Results obtained by five cooperative laboratories in analyzing samples of a mixture containing about two-thirds wool and one-third rayon showed fairly good agreement. A detailed discussion of the interlaboratory study was reported earlier (*E. S. R.*, 86, p. 570).

Fiber research results in new process with which wool can be improved, M. HARRIS (*Textile Res.*, 12 (1941), No. 1, pp. 19-22, figs. 2).—This brief article, representing a translation of technical findings into lay language, points out that a chemically modified wool which is strongly resistant to attack by moths, bacteria, molds, and many chemicals has been achieved.

A new era in finishing began with development of the anti-crease finish (*Textile Res.*, 12 (1942), No. 3, pp. 18-21, fig. 1).—This brief discussion points out that the anticrease finish for rendering cotton and rayon fabrics resistant to crush and crease consists essentially of treating fabrics in such a way that a synthetic resin is formed within the individual fibers. This not only increases the resilience of various types of fabrics, but also increases their tensile strength, weight, and resistance to abrasion, and reduces yarn slippage and the tendency of woven fabrics to shrink during laundering. The application of synthetic resins in finishing textiles is also used to impart a woollike feel to spun rayons; to produce permanent glazed-chintz finishes on fabrics for draperies, etc.; to obtain transparent waterproof finishes on silk or rayon fabrics; and to obtain new and improved finishes through utilization in warp sizing and in printing and dyeing.

The water absorption by towels, P. LAROSE (*Amer. Dyestuff Rptr.*, 31 (1942), No. 5, pp. 105-108, 123-124, figs. 10).—Water absorption was measured by determining the weight of water absorbed in a given interval by a specimen of the toweling brought in contact with the wetted surface of some porous material. Two coarse alundum plates, $\frac{3}{16}$ in. thick by 5 in. in diameter and placed one on top of the other, were used for this porous material in the apparatus developed for the test. These plates were kept wet by connecting the receptacle which held them with a constant level reservoir, the top of the plates being adjusted at a level from $\frac{1}{4}$ to $\frac{5}{16}$ in. above that of the water in the reservoir. A weighed 2-in. square of the toweling was placed on the thoroughly wetted plates and covered with a glass plate $3\frac{1}{2}$ in. square weighing 35 gm. After a predetermined interval, the specimen and covering plate were transferred to a tared watch glass and weighed to determine the water absorption. All tests were carried out under the standard conditions of 65 percent relative humidity and 70° F. Ten terry towels (2 colored) and 1 huck towel were tested.

The results obtained, presented as graphs showing the water absorbed (grams per gram of cotton) at different intervals, indicated that removal of impurities, particularly waxes or oily matter, either by laundering or by solvent extraction increased the absorption, particularly in the case of poor samples. Once the impurities were removed, the absorption of the different samples tested was practically the same. Nearly all of the laundered or extracted samples absorbed 150 percent of their own weight of water within the first 15 sec., and since they were so wet at this point as to be useless for drying purposes, it was considered that they were equally good. The test, therefore, served not to compare the value of one towel material with another, but rather to judge the effectiveness or thoroughness of a scouring treatment. Tested after laundering the huck towel was as good, weight for weight, as the terry towel, and the colored towels absorbed as well as the white ones. It is pointed out that the advantage of the pile in terry towels is that of adding weight and, therefore, absorbing material without increasing the size or stiffness of the towel.

HOME MANAGEMENT AND EQUIPMENT

Home production of food supplies (*Tennessee Sta. Rpt.* 1940, pp. 13-15).—Progress in this project (E. S. R., 85, p. 575), summarized by J. J. Bird, involved extension of the diet-health phase to 160 families in 11 communities, including the Cumberland homesteads. Records of family food consumption, and many physical examinations and histories were obtained. The physical examinations, including determinations of bone density and blood and urine analyses, were made in cooperation with the Rockefeller Foundation in its studies in human nutrition now being conducted through Vanderbilt University, and the results are briefly noted.

A review of metal utensils for surface cooking, A. E. BARAGAR. (Nebr. Expt. Sta.). (*Jour. Home Econ.*, 33 (1941), No. 10, pp. 706-710).—Information, based largely on data secured by the author in a series of technical tests, is given on the relative durability, sanitation, ease of handling, performance, and price of enamelware, stainless-steel, chrome-ware, and cast-iron utensils in comparison with the no longer available aluminum.

"When price is eliminated from consideration, the best substitute for aluminum would be the copper-bottom stainless-steel pan, and the all-stainless-steel pan would be the next choice. While the cast-iron skillet is heavy to handle, it is best adapted to replace the cast-aluminum skillet as an all-purpose skillet. Except for the possibility of the chromium plating coming off, the chromium-plated copper skillet seems to be desirable as a light-weight skillet."

MISCELLANEOUS

Science and the land: The 62nd Annual Report of the New Jersey State Agricultural Experiment Station and the 54th Annual Report of the New Jersey Agricultural College Experiment Station, 1940-41, W. H. MARTIN (*New Jersey Stas. Rpt. 1941, pp. 168, pls. 15*).²

Fifty-second Annual Report [of New Mexico Station, 1941], F. GARCIA (*New Mexico Sta. Rpt. 1941, pp. 87, figs. 10*).²

Fifty-fourth Annual Report of the South Carolina Experiment Station, [1941], H. P. COOPER ET AL. (*South Carolina Sta. Rpt. 1941, pp. 182, figs. 41*).²

Fifty-third Annual Report [of Tennessee Station], 1940, [C. A. MOOERS ET AL.] (*Tennessee Sta. Rpt. 1940, pp. 110, figs. 35*).²

Fifty-first Annual Report [of Washington Station], 1941, E. C. JOHNSON ET AL. (*Washington Sta. Bul. 410 (1941), pp. 142*).²

Agricultura Experimental, [November-December 1941] (*Agr. Expt. [Puerto Rico Univ. Sta.], 1 (1941), No. 6, pp. [8], figs. 3*).—In addition to an article noted on page , this number contains *Hacia la victoria* (To Victory), by J. A. B. N[olla] (pp. [1-2]); *Mejoramiento de las habichuelas en Puerto Rico* (Improvement of Kidney Beans in Puerto Rico), by G. A. Lebedeff and J. Adsuar (p. [3]); *Estudios comparativos acerca de la poda del cafeto* (Comparative Studies of Coffee Pruning), by J. Guiscafré Arrillaga and L. A. Gómez (pp. [3, 6,]); *El cultivo de la guayaba y sus posibilidades industriales* (Guava Culture and Its Industrial Possibilities), by J. S. Simons (pp. [4, 6]); *La isla produce mas de la mitad de los alimentos que consume* (The Island Produces More than Half of the Food It Consumes) (p. [7]); and *El almácigo* (The Mastic Tree), by J. I. O[tero] (p. [8]).

² The experimental work not previously referred to is for the most part noted elsewhere in this issue.

NOTES

Arkansas University and Station.—Studies of the nutritive value of rice and its byproducts are to be begun with the aid of a grant from the Research Corporation.

Dr. Isabella C. Wilson, professor and head of the department of home economics, has resigned. Recent appointments include Julien R. Tatum as instructor in rural economics and sociology, Dr. T. C. Liu as research assistant in plant pathology, and Tom Guthrie as scientific assistant at the Rice Branch Station.

California University and Station.—John W. Gilmore, professor of agronomy and agronomist at Davis since 1913 and widely known for his work on soil management and crop production, died June 25, aged 70 years. A native of Arkansas, on graduation from Cornell University in 1898 he went to China and established an Agricultural College at Wuchang. After about 2 years at the Agricultural Normal School in Honolulu and as the organizer of agricultural schools in the Philippine Islands, he returned to Cornell in 1902 as assistant professor of agriculture. In 1907 he became professor of agriculture in the Pennsylvania College and a year later was appointed president of the College (now the University) of Hawaii. In addition to his duties in California, he had served as agricultural expert and adviser to Chile in 1921 and again in 1936, to the Dominican Republic in 1925, and to Mexico in 1931-32.

Connecticut [New Haven] Station.—The annual Field Day, which has become an agricultural event of increasing interest in the State since its beginning 35 years ago and which last year attracted over 1,000 visitors, has been canceled as a result of the war.

Dr. Alfred J. Wakeman, for 30 years engaged in biological chemistry research, including nutrition studies, proteins of milk, and more recently the biochemistry of plants, retired July 1. Dr. Jane Winternitz has been appointed assistant in biochemistry. Dr. George A. Gries joined the staff on June 1 as assistant plant pathologist to work on root disease generating from the Dutch elm disease.

Idaho Station.—The research program has been revised to bring it more nearly in line with immediate war needs. Nutrition of man and animals, the efficient use of fertilizers, an all-out campaign against plant pests, research in agricultural engineering, and processing foods grown and livestock raised by the farmer are being emphasized.

Purdue University and Indiana Station.—Among the members of the station staff called into the armed services in the last few months are G. P. Walker, associate in agronomy, and Frank R. Olson, assistant in botany and agronomy. Charles W. Hughes, assistant chemist, has resigned.

Recent additions to the staff include Dr. L. M. Hutchings of the Michigan Station as assistant professor in veterinary science and associate in the station and Dr. P. C. Brown as technical assistant in veterinary science; John O. Almquist as assistant in animal husbandry; E. D. Schall, Lowell F. Green, R. H. King, M. S. Bergdoll, J. D. Hatfield, and Harold A. Nash as assistant chemists; B. A. Krantz, J. E. Steckel, M. T. Vittum, L. R. Kangas, J. E. Larson, J. E. Barnes, O. W. Luetkemeler, and K. A. Frischle as technical assistants in

agronomy and A. J. Ohlrogge as assistant in agronomy; Ray E. Cudney as assistant in botany and L. L. Woodruff as technical assistant in botany; R. K. Waugh as assistant in dairy husbandry; E. L. Johnson as assistant in poultry husbandry; and Dr. H. E. Milliron as assistant in entomology and assistant professor in the university.

Iowa College and Station.—Development of a new type of corn, called waxy maize, to replace tapioca hitherto imported from the East Indies has been announced. This type is believed to be of special promise for the uses of tapioca other than starch. Laboratory work with the new corn has resulted in planting of sufficient quantities to provide a semicommercial trial of the starch under actual factory conditions.

Science notes the appointment of Dr. Eugene G. McKibben, research professor of agricultural engineering, as head of the department of agricultural engineering in the Michigan College.

Kansas College and Station.—A tract of 320 acres adjoining the Colby Branch Station has been purchased, giving possession of an entire section of land for the use of the station with the exception of a small area devoted to the fair-ground.

The honorary degree of master of family life was conferred by the college for the first time on May 25, the recipient being Alice Vail Waugh '98 of Amherst, Mass.

Clarence L. Gish, superintendent of the poultry farm, has resigned to accept a position with the U. S. D. A. poultry improvement work in the State and has been succeeded by Wilbert Greer. Dr. B. W. Beadle, assistant chemist, has accepted a position with the American Meat Institute in Chicago. D. L. Mackintosh, associate professor of animal husbandry and in charge of meats research and teaching, has been granted leave of absence to accept a position as captain in the foods and nutrition subdivision of the Army Sanitary Corps. Dr. P. H. Vardiman, instructor in bacteriology and assistant in poultry diseases, has resigned to engage in veterinary practice in Illinois.

Recent appointments in agronomy include R. F. Sloan as assistant in charge of the north central Kansas experiment fields and D. E. Crumbaker as assistant in charge of the bindweed experiment field.

Kentucky Station.—A 3-year study of timber lands in eastern Kentucky has been launched by the land economics section with the aid of a grant from the General Education Board. The study will deal with the kinds and quantities of timber available, the question of whether timber growing is preferable to agricultural use of the land, markets, employment of people, cutting practices to make forests continuously productive, and other phases. Breathitt County has been selected as typical of the Appalachian highlands region, and most of the work will be located in this and nearby counties.

Louisiana Station.—L. V. George, editor, has gone into the Army and will be succeeded by Emmet J. Lee, Jr.

Maryland University and Station.—Since September 1, 1941, approximately 40 percent of the work of the station has been changed in some way to make it more directly a contribution to the food production program as part of the war effort of the Nation. The work is now considered to be virtually 100 percent a war production effort. It is also planned to develop a program of work in connection with the post-war period.

Military leave has been granted to Dr. H. G. Shirk, assistant professor of plant physiology; Dr. Howard L. Stier, assistant professor and assistant horticulturist; J. M. Gwin, associate professor and associate in poultry production and marketing; and Chester W. Hitz, assistant pomologist. Dr. Howard L. Bodilly, instructor and assistant in bacteriology, has resigned.

Massachusetts Station.—Dr. Carl R. Tellers, research professor of horticultural manufactures, has been called to active duty with the Chemical Warfare Corps of the Army. A vacancy created in nursery culture through the resignation of Assistant Research Professor H. S. Tiffany has been filled by the appointment of C. J. Gilgut, formerly of the botany department.

Montana Station.—Maxwell Sargent has been appointed assistant in horticulture.

North Carolina Station.—In response to requests from various parts of the State, the station is beginning research seeking to find herbs suitable for growth under North Carolina conditions. The work has been placed in charge of L. G. McLean, recently appointed associate horticulturist.

Oklahoma Station.—Four strains of superior quality of cotton developed through research by the station and the Work Projects Administration have been planted at the Tipton Substation. Twelve hundred acres are being devoted to the undertaking.

Robert F. Wall, assistant chemist, resigned April 26 to enter defense work at a commercial magnesium plant at Freeport, Tex.

Oregon College and Station.—Dr. Walter Sheldon Brown, associated with the institution since 1913 and professor of horticulture and horticulturist since 1920, died May 2, aged 64 years. A native of New York, he was graduated from Cornell in 1904 and received the M. S. degree from the University of Wisconsin in 1906. His work had dealt especially with pears and small fruits.

Rhode Island College and Station.—Jane C. Ebbs has resigned as assistant instructor in the college and assistant in home economics in the station to accept a position with the U. S. D. A. Bureau of Home Economics.

Texas Station.—Dr. Noe Higinbotham has been appointed plant physiologist to carry on rice investigations at the Beaumont Substation during the absence of Lt. C. E. Minarik.

Washington Station.—Dr. C. A. Larson, specialist in irrigation investigations at the Prosser Substation, has become superintendent of the U. S. D. A. field station at Belle Fourche, S. Dak. Dr. L. C. Wheeting, research professor of soils, has been granted leave of absence to accept a commission as major in the U. S. Army. Recent appointments include D. R. McCormick as assistant chemist vice Dr. A. M. Neubert, resigned to become associate chemical technologist in the U. S. D. A. Bureau of Agricultural Chemistry and Engineering, with headquarters at the college; R. W. Colby as research assistant in animal husbandry; and Dr. Ethelwyn Wilcox as assistant home economist vice Virginia Landquist. Dr. R. J. Evans, assistant poultryman has been transferred as assistant chemist.

Wyoming Station.—Dr. J. A. Hill has been appointed chairman of the agricultural committee of the Albany County National Defense Council and will advise on victory gardens in Laramie and nearby vicinity. C. Harold Gilbert, associate research apiculturist, has been granted a year's leave to engage in commercial work. Dr. Irene Rosenfield has been appointed assistant in pharmacology and pathology vice Dr. William B. Bradley, resigned. Dayton L. Klingman has been appointed instructor in agronomy and research assistant in the department of agronomy and agricultural experiments.

Association of Land-Grant Colleges and Universities.—Because of the taking over by the Army of the Stevens Hotel on August 1, the date of the fifty-sixth annual convention (E. S. R., 87, p. 160) has been changed to October 28-30, 1942, and the pre-convention dates to October 24-27. The new headquarters will be the Drake Hotel.

EXPERIMENT STATION RECORD

VOL. 87

OCTOBER 1942

No. 4

DR. HENRY GRANGER KNIGHT, A DYNAMIC RESEARCH DIRECTOR

Although his service as an experiment station executive came to a close about 15 years ago, Dr. Henry Granger Knight, who died in Washington, D. C., on July 13, 1942, had made for himself a distinct place among those who have risen to eminence in these institutions. His work since 1927 as a Bureau Chief of the Federal Department of Agriculture had perpetuated and extended his station contacts, and his relations with these institutions and their personnel had continued to be direct, sympathetic, and appreciative. He had retained his interest in the experiment station subsection of the Association of Land-Grant Colleges and Universities and to an unusual degree had exercised his privileges as a former station director, freely participating in their sessions and informal assemblages and characteristically still thinking and being thought of as essentially one of their group.

Dr. Knight himself was wont to claim facetiously as his outstanding distinction that of having been director of more experiment stations than any other individual. This claim had as its basis his occupancy of the directorship of the Wyoming Station from 1910 to 1918, the Oklahoma Station from 1918 to 1921, and the West Virginia Station from 1922 to 1927. Shifts of directors from one State to even a second are not common, and two such transfers are undoubtedly unusual if not unique. Regardless of mathematical accuracy, however, what is of real importance is that while his service in each State was comparatively brief, the conditions diverse, and each institution confronted with administrative difficulties, all of the three stations made distinct gains under his guidance.

He came to know the land-grant institutions unusually well, but his connection with them did not begin until 1904. At that time he was 26 years old, a native of Kansas but the recipient of both the bachelor's and master's degrees in chemistry from the University of Washington, accredited with other chemical study at the University of Chicago, and with several years' experience in teaching chemistry in the University of Washington. He then became professor of chemistry and State chemist of Wyoming. Subsequently, in addition to his station directorships, he was in charge of Farmers' Institutes in Wyoming

from 1910 to 1918, dean of the College of Agriculture from 1912 to 1918, dean of the Oklahoma College of Agriculture from 1918 to 1921, research chemist in the West Virginia Station from 1922 to 1927, and dean of agriculture in the West Virginia University from 1926 to 1927.

Dr. Knight's work as a research chemist led to his attainment of the Ph. D. degree in 1917 from the University of Illinois and to numerous honors later in life. His investigations covered a wide field, including analytical methods, food adulteration, the effect of alkali on concrete, poisonous plants, soil acidity, and many other topics. He served as president of the American Institute of Chemists in 1933-35, and in 1941 was presented by Hon. Henry A. Wallace, then Secretary of Agriculture and now Vice President, with the institute's medal for "noteworthy and outstanding service to the science of chemistry or the profession of the chemist in America."

Valuable as were his individual contributions, however, he will probably be longest remembered as an organizer and director of research. His success as a station director was further augmented by his 15 years' service with the Department. Of late he had been especially interested and active, as Chief of the Bureau of Agricultural Chemistry and Engineering, in the organization and development of the four regional research laboratories of the Department on new and extended uses for surplus farm commodities.

Whatever the task, he brought to its solution a thorough knowledge and sound appreciation of research, a practical viewpoint, a keen and resourceful mind, and a dynamic personality. Better than most men, he visualized not only what needed to be done but what might reasonably be expected and how it could be accomplished. In the words of a recent tribute by Secretary of Agriculture Claude R. Wickard, "he has been an important factor in the development of scientific agriculture and the relationship between farming and industry. His loss is particularly heavy at this time, when the country is using its every resource to win the war. However, we are fortunate in having the modern research organization he did so much to build."

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Raw products research activities (*Washington, D. C.: Natl. Canners Assoc., [1942], pp. 42*).—This is a review of recent progress as presented in bulletins and annual reports of the State experiment stations and the U. S. Department of Agriculture received during the period October 1941–April 1942. It is pointed out that “the huge and increasing requirements of the Government for food production, including the vegetables and fruits that are the canning industry’s raw products, together with the difficulties of growers and canners resulting from labor, transportation, and other shortages, combine to place before agricultural research its greatest opportunity, obligation, and challenge.”

Advances in enzymology and related subjects, I, edited by F. F. NORD and C. H. WERKMAN (*New York: Interscience Pub. Inc., 1941, vol. 1, pp. X+433, figs. [56]*).—This is a collection of reviews or brief monographs, including the following papers: Protein Structure, by H. B. Bull (pp. 1–42); Physikalisch-chemische Gesichtspunkte zum Problem der Virusaktivität [Physicochemical Viewpoints for the Problem of Virus Activity], by L. Holzapfel (pp. 43–62) (*E. S. R.*, 85, p. 68); The Specificity of Proteinases, by M. Bergmann and J. S. Fruton (pp. 63–98); Metabolic Generation and Utilization of Phosphate Bond Energy, by F. Lipmann (pp. 99–162); The Chemical Nature of Catalase, by J. B. Sumner (pp. 163–176); Enzymes and Trace Substances, by D. E. Green (pp. 177–198); Photosynthesis, Facts, and Interpretations, by J. Franck and H. Gaffron (pp. 199–262); The Bacterial Photosyntheses and Their Importance for the General Problem of Photosynthesis, by C. B. Van Niel (pp. 263–328), and Untersuchung enzymatischer Prozesse in der lebenden Pflanze [Investigations of Enzymic Processes in Living Plants], by A. L. Kurssanov (pp. 329–370), all previously noted (*E. S. R.*, 85, p. 173); and Die Verdauung bei den niederen Vertebraten [Digestion in Lower Vertebrates], by H. J. Vonk (pp. 371–417).

Effects of moisture on the physical and other properties of wheat, C. O. SWANSON. (*Kans. Expt. Sta.*). (*Cereal Chem.*, 18 (1941), No. 6, pp. 705–729, figs. 3).—Results from exposing wheat before threshing to various degrees of moisture and also from wetting threshed wheat grain to various moisture percentages from once to six times are noted. Wetting wheat artificially in the straw and then drying did not produce as great physical effects as when shocked wheat was exposed to several rains. Wetting as grain produced changes somewhat similar to those caused by the rains. The greatest apparent effects of wetting were a lowering of test weight and decreases in vitreousness. Hardness as determined by the barley pearler was also decreased. Decreases in test weight were not accompanied by correspondingly lower flour yields in the samples wetted after threshing. Samples wetted as grain, the test weights of which had been reduced as much as 6 lb., gave essentially as high flour yields as samples not wetted or those wetted comparatively little. Ash figures varied only within the experimental limits. Decrease in test weight is due mostly to the swelling of the kernels but partly to the roughening of the bran coat. The baking

values obtained on representative samples did not correlate with the commercial grade of the grain nor with the severity of the treatment. The curves made on the recording dough mixer showed a longer time of development and a decrease in height as a result of the more severe treatments.

Parallelism between starch dextrinizing and liquefying activities of amylases, C. M. HOLLENBECK and M. J. BISH. (Nebr. Expt. Sta.). (*Cereal Chem.*, 18 (1941), No. 6, pp. 754-771, figs. 6).—The dextrinizing and liquefying functions of amylases from malted wheat, *Aspergillus oryzae*, and a bacterial preparation were studied. Malt dextrinizing power was measured by a Wohlgemuth iodine method (E. S. R., 20, p. 208), alpha dextrinizing activity by the method of Sandstedt, Kneen, and Blish (E. S. R., 83, p. 440), and liquefying power by a viscosimetric procedure. Either of the last two methods appears reliable for the estimation of α -amylase activity, but the viscosimetric method involves the preparation of starch pastes having standard and constant properties, requiring considerable time and careful manipulation. For a specified duration of time, also, the degree of liquefaction is not a linear function of the quantity of amylase present, and a reference curve must be established and used for calculating results. The modified Wohlgemuth method is primarily chemical rather than physical, requires less equipment, is less time-consuming than the viscosimetric method, and the time required to reach the iodine end point is a linear function of the quantity of amylase present.

When extracts of the three enzyme preparations were adjusted to equal alpha dextrinizing power, their liquefying activities also were found to be substantially the same. The two types of activity appear to be equally affected by heat and by changes in pH. Calcium ions seem to protect both functions equally against heat inactivation. This consistent parallelism of behavior is held to justify the conclusion that both the liquefaction and the alpha dextrinization of starch paste by amylases are attributable to the action of the single enzyme, α -amylase. The amylase of bacterial origin showed a higher optimum pH range and a greater resistance to heat than did the amylases of malted wheat and of *A. oryzae*.

The starch degrading properties of barley malts, E. KNEEN, O. C. BECKORD, and R. M. SANDSTEDT. (Nebr. Expt. Sta.). (*Cereal Chem.*, 18 (1941), No. 6, pp. 741-754).—Determinations of saccharification, dextrinization, or liquefaction of starch measure accurately only the specific function determined. Saccharogenic values are largely dependent on β -amylase and give some idea as to relative content of this component, but α -amylase may be estimated only by methods in which varying content of β -amylase does not influence the results. Either the starch-liquefaction method of Józsa and Johnston (E. S. R. 75, p. 160) or the modified Wohlgemuth technic of Sandstedt, Kneen, and Blish (E. S. R. 83, p. 440) appears specific for the alpha component. The two most significant of the amylolytic determinations commonly made on malt appear to be the malt saccharogenic activity and the alpha dextrinogenic activity. From these two determinations the β -amylase activity may be calculated. The summation of the α - and β -amylase activities provides an approximation of the malt dextrinogenic activity. α -Amylase values alone accurately measure starch-liquefying power and provide an estimate of the ability of the malt extract to hydrolyze raw wheat starch and of the probable autolytic diastatic activity of the malt meal itself.

Comparative transmission spectrograms of an irradiated leaf extract, F. F. FERGUSON and L. W. WEBB, JR. (Va. A. and M. Col. et al.). (*Plant Physiol.*, 16 (1941), No. 1, pp. 210-211, fig. 1).—A dilute solution of the methyl alcohol extract of a grass (*Poa pratensis*) showed a marked decrease in the two absorption peaks after 2 hours' exposure of the tube of solution to the radiation from

a 200-w. clear electric bulb at 15 cm. distance. Holding alcoholic solutions of the leaf green in the dark for 2 days produced no detectable change in the absorption curves.

Hexose-phosphate in alfalfa hay, S. H. THOMPSON, JR., and W. E. TOTTINGHAM. (Univ. Wis.). (*Plant Physiol.*, 16 (1941), No. 1, pp. 212-213).—Leaves from the K-fertilized and K,P-fertilized crops contained 1.6 and 2.6 percent, respectively, of the total phosphorus in the basic lead precipitate. The lead salts were decomposed by H₂S and the hexose-phosphate was converted to calcium salt and monophosphate osazone. Osazone preparations melting at 140.0° and 140.3° C. were obtained. These results appear to substantiate the occurrence of hexose-monophosphate in alfalfa hay and to show that it survives the action of phosphatase in the curling process.

Composition of the tops and roots of the timothy plant at successive stages of growth, M. PHILLIPS, B. L. DAVIS, and H. D. WEIHE. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 9, pp. 533-546).—After an initial increase, the percentage of ash in the tops decreased as the plants grew older while that in the roots was rather irregular. The percentage of nitrogen (and crude protein) decreased generally with maturity in the tops, but in the roots it decreased in the early stages of growth and reached a minimum in the fifth harvest period, after which there was no significant change. The quantity of nitrogen and crude protein increased rapidly in the tops, while in the roots it showed little variation in the early stages of growth and a somewhat greater increase in the later stages. The percentage and absolute quantity of methoxyl in the tops increased regularly, but in the roots there was no appreciable variation in the percentage at successive stages although the quantity increased somewhat. The quantities of the various extractives in the tops and roots increased steadily, although not uniformly, with the increase in the age of the plants. The percentages of uronic acids in the tops and roots decreased generally, although not regularly, while the absolute quantities generally increased. The percentage of total furfural generally showed an upward trend in the tops and in the roots was rather irregular. The percentage of pentosans generally increased in the tops with the age of the plants, but in the roots it was rather irregular with the general trend downward. The percentage of crude cellulose in the tops generally increased with growth, although not regularly, but in the roots it was rather irregular. The percentages of crude lignin (Phillips' method (E. S. R., 76, p. 153) and methoxyl in the lignin of the tops increased. The percentage of crude lignin in the roots showed no significant variation, while the percentage of methoxyl in the crude lignin showed a slight trend upward. The percentages of pectic substances (as calcium pectate) in the tops and roots showed a general trend downward. The absolute quantities of the pentosans, crude cellulose, lignin, and pectic substances increased quite steadily. There was no evidence to indicate that the plant synthesized lignin from either cellulose, pentosans, or pectic substances.

Lactic acid formation in alcoholic fermentation by yeast, L. A. HOHL and M. A. JOSLYN. (Univ. Calif.). (*Plant Physiol.*, 16 (1941), No. 2, pp. 343-360, figs. 4).—During the course of fermentation of grape and artificial media by seven strains of *Saccharomyces cerevisiae*, lactic acid accumulated at the relatively constant rate throughout the period of sugar utilization, indicating a close relationship between lactic acid formation and sugar utilization. The behavior of all seven organisms was very similar in these fermentations. With a variety of carbon sources and nitrogen sources, the quantities of lactic acid formed were found to depend upon the composition of the media and upon the strain of yeast used. No appreciable difference in lactic acid production was

observed between fermentations with cotton stoppers and those with mercury bungs. In general, these results confirm the observation that lactic acid is an important byproduct of alcoholic fermentation by pure yeast. The lactic acid formed was determined by the method of Friedemann and Graesser (E. S. R., 70, p. 297) and sugars by that of Hassid (E. S. R., 79, p. 9).

Nature of bound water in colloidal systems, R. C. CHANDLER. (Univ. Calif.). (*Plant Physiol.*, 16 (1941), No. 2, pp. 273-291, fig. 1).—The author offers a new interpretation of some bound water phenomena. His results indicate that bound water in colloidal systems may be of two kinds—(1) a small amount of water intimately associated with the colloidal and having special thermodynamic properties, and (2) a hypothetical amount of water estimated to account for the differences between the value of a property of water as found in a complex solution and the corresponding value in simple solution. The second kind of bound water may be exhibited by any complex solution, colloidal or noncolloidal, whose components have properties which make the solution nonideal. The part played by colloids in this phenomenon appears to be due chiefly to their electrical properties and may be of minor importance compared with crystalloidal components. Solvent molecules in a dilute colloidal solution show no reduction in the random orientation characteristic of the pure solvent.

Semimicropynometer for heavy water, B. J. FONTANA and M. CALVIN. (Univ. Calif.). (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 2, pp. 185-186, figs. 2).—Small samples (about 1 cc.) of heavy water were manipulated and purified by distillation in a high-vacuum line. A simple and convenient pynometer which took advantage of the use of the high-vacuum line for filling it, therefore, was devised. The construction and manipulation of the device are described and illustrated.

Molecular still heads, A. J. BAILEY (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 2, pp. 177-178, figs. 2).—Designs for apparatus of two sizes, both made up from relatively inexpensive standard glass parts, are described and illustrated.

Instrumental methods of chemical analysis, R. H. MÜLLER (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 10, pp. 667-754, figs. 191).—This monograph presents in some detail the present-day uses of modern instruments in analytical procedures. Literature citations number 313.

Continuous liquid extractor for large volumes of solution, R. HOSSFELD. (Minn. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 2, p. 118, fig. 1).—Solvent vapor passes from a boiling flask fitted with a two-hole stopper to a vertical condenser, the condensate flowing down a tube having an offset from the condenser to the top of a distilling flask and a vertical portion entering the distilling flask through a two-hole stopper and terminating below the side tube of the flask. The side tube of the distilling flask is bent at its end vertically downward to pass through the second hole of the boiling flask stopper constituting the solvent return. A motor-driven stirrer operating on the centrifugal pump principle is placed in the second hole of the stopper in the top of the distilling flask to complete the apparatus. A part of the stem of the stirrer is of tubing having a hole blown in its side near the top of the solvent layer and a T piece sealed to its lower end to form both the stirring arms and centrifugal element.

An improved sublimation apparatus, O. A. NELSON. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 2, p. 153, fig. 1).—The convex shape of the lower end of the usual Hopkins-type condenser is replaced by a concave surface produced by heating the end of the condenser just to the softening point of the glass and drawing it in by careful suction. Three legs of glass rod are sealed on around the edge of this concave surface, and their free ends are bent

inward to support a disk of 40-mesh wire gauze. The lower end of the condenser may with advantage be expanded to a bulb of a diameter nearly equal to the inside diameter of the outer vessel of the sublimator and the lower surface of the bulb drawn inward to form the concave collecting surface above noted. With a bath used for heating, the surface of the liquid should be at about the level of the screen or a trifle above to prevent sublimation on the screen and clogging of the meshes.

An improved methoxyl apparatus, A. J. BAILEY (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 2, p. 181, fig. 1).—The proposed apparatus represents a simplification in design, with much improved operating characteristics.

An apparatus for the measurement of bread crumb deformation, B. A. NIKOLAYEV (*Cereal Chem.*, 18 (1941), No. 6, pp. 790–796, figs. 3).—The author describes and illustrates an apparatus consisting essentially of a lever, the shorter arm of which carries a semispherical button or pressure finger, the longer arm being a pointer moving over a graduated arc. The shorter arm is extended to form a hook on which is hung a waxed paper cup. A measured quantity of water is run into the waxed paper cup, pressing the semispherical knob into the test piece of bread which is supported on a platform of adjustable height brought to a position such that the knob is in contact with the test piece and the pointer at the zero of the scale before water is added to the cup. Total deformation or compressibility is read 1 min. after running in the weighting water. Elastic deformation or elasticity is measured by removing the weight after 1 min. and taking a second reading after a further 2 min., the required value being indicated by the difference between the two readings. The arm lengths from the center of the pressure knob to the fulcrum and from the fulcrum to the end of the pointer are in the ratio 1:10. The essential features of the apparatus are shown in a drawing and photograph.

A method for the micro-estimation of iron in biological materials, R. H. THORP (*Biochem. Jour.*, 35 (1941), No. 5–6, pp. 672–675, figs. 2).—The method described involves wet ashing of the material, using perchloric acid, HNO_3 , or H_2O_2 for oxidation. The excess acid is neutralized with solid Na_2CO_3 , the neutral solution is reacidified with HCl to about pH 4, and after dilution the iron is determined as the red complex formed with α, α' -dipyridyl, the color being read either colorimetrically or photometrically. Amounts of iron as small as 0.2 μg . per cubic centimeter can be estimated. Zinc, copper, and other metals do not interfere with the test when the quantities of these elements are comparable with that of the iron. The α, α' -dipyridyl is prepared by boiling 2-bromopyridine with cymene in the presence of copper powder for 1½ hr. The cymene is then distilled off in steam, the residue made alkaline, and finally the α, α' -dipyridyl is distilled, the product being purified by recrystallizing from 20 percent alcohol.

The iron content of cereals, J. S. ANDREWS and C. FELT (*Cereal Chem.*, 18 (1941), No. 6, pp. 819–826).—In the simple method described a 2- to 5-gm. sample is ashed in a porcelain crucible in a muffle furnace at 575° C. for from 16 to 18 hr. After cooling, the ash is dissolved by heating for a few minutes, with 2 cc. of concentrated HCl added directly to the crucible. As an alternative to this treatment, which eliminates the pyrophosphate interference, the ash may be fused with sodium carbonate, although this latter procedure is less convenient. The ash solution is transferred to a volumetric flask and made up to volume. A 10-cc. aliquot is transferred to the colorimeter tube and the following solutions are added: Two cc. of 2½ percent hydroquinone (as a reducing agent), 5 cc. of acetate buffer, and 2 cc. of 0.1 percent α, α' -dipyridyl solution. After mixing, the color developed is read in an Evelyn photoelectric colorimeter. To compensate for any traces of iron which may be present in

the various reagents, a blank is prepared and this solution is used for adjusting the photoelectric colorimeter.

Preliminary trials showed that the ashing procedure described caused no loss of iron from flour ashed as such or after the addition of various iron compounds including ferric chloride. Bread made with salt likewise showed no loss of iron upon ashing. The iron content of whole wheat and various milling products was determined.

Comparison of various hemoglobin methods as performed in hospital and physicians' laboratories, W. G. KARR and J. H. CLARK (*Amer. Jour. Clin. Pathol., Tech. Sect., 5 (1941), No. 5, pp. 127-147, fig. 1*).—Twelve laboratories cooperated in an investigation to determine the accuracy of some of the methods routinely used in clinical laboratories. The results, presented and discussed in some detail, indicated that the method of reading hemoglobin as oxyhemoglobin in the electric photometer after appropriate dilution with a weak alkali is very precise and convenient and should be the method of choice whenever possible. Certain acid hematin methods, when carefully controlled as to method of preparation, time of reading, and cleanliness and standardization of instruments, gave values considered sufficiently precise for routine examinations in the clinical laboratory. The Tallqvist method, even with improved color scale, was not sufficiently precise for accurate determinations, but because of simplicity and reasonable accuracy was considered adequate in the physician's practice as an aid in diagnosing an anemia and evaluating therapeutic measures. Inaccurately calibrated pipettes, careless technic, improper care of instruments, inaccurately calibrated hemoglobinometers, and variations between individuals in color matching were found to be the various sources of error. It was also found that the trained technicians usually obtained more accurate results than did the physicians who made the tests during the course of this study.

The determination of lead in biological materials, F. L. SMITH, 2ND, T. K. RATHMELL, and T. L. WILLIAMS (*Amer. Jour. Clin. Pathol., 11 (1941), No. 8, pp. 653-668*).—This study is summarized by the authors as follows:

"An analytical procedure for the determination of minute amounts of lead in blood, serum, leucocytes, erythrocytes, spinal fluid, urine, feces, organs, tissues, and bones based upon a wet digestion of the sample, extraction of the lead with diphenylthiocarbazone (dithizone), and a titrimetric end point determination are given in detail. A modification for the removal of bismuth depending upon its extraction with diphenylthiocarbazone at a pH of 2.8 is incorporated in the general procedure. Methods for deleading glassware, syringes, needles, and the purification of reagents are discussed. The interpretative difficulties encountered in evaluating analytical data and its dependence upon treatment and other clinical factors is demonstrated by comparison of an actual example of lead poisoning with values of normal individuals and types of plumbism."

Determination of lead in sugars and sugar products: An adaptation of the diphenylthiocarbazone reaction, T. D. GRAY (*Indus. and Engin. Chem., Analyt. Ed., 14 (1942), No. 2, pp. 110-114, figs. 4*).—The author describes a diphenylthiocarbazone method by means of which the lead content of a sugar product may be determined without ashing, without centrifugal separation of the aqueous from the chloroform layer, and with but a single concentration of the extracting reagent and a single extraction. Zinc ions are rendered nonreactive by the use of potassium cyanide. Other interfering ions were found to be absent in ordinary work on sugar products.

A method for the estimation of inositol, D. W. WOOLLEY (*Jour. Biol. Chem., 140 (1941), No. 2, pp. 453-459, fig. 1*).—The method consists essentially in

determining in an Evelyn photoelectric colorimeter the turbidity produced by the growth of the Hansen No. 1 strain of Toronto yeast (*Saccharomyces cerevisiae*) in a series of blanks containing a basal inositol-free medium and graded amounts of the material to be tested and estimating the inositol content by comparison with a standard curve drawn from similar turbidity readings obtained with graded amounts of inositol. The technics followed, which are described in detail, are based upon the observation that the yeast used requires inositol for growth; that the esters of inositol, while active for mice, are not active for yeast and that consequently natural materials to be tested must be subjected to a preliminary hydrolysis to convert the esters into inositol; and that by dialysis of aqueous extracts of rice bran or liver it is possible to remove the inositol and retain certain unidentified growth factors for yeast. It has been shown that inositol or sodium phytate added to various natural products can be quantitatively recovered by this method. The materials tested included corn with an inositol value of 0.50 μ g. per gram, oats 1.0, alfalfa leaf meal 2.1, beef liver 3.4, beef heart 16.0, brewers' yeast 5.0, and whole milk 0.50 μ g. per gram.

Content of l-pimaric acid in pine oleoresin: Improved methods for its determination, E. E. FLECK and S. PALKIN. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 2, pp. 146-147).—Determination of the l-pimaric acid content of longleaf pine oleoresin throughout the turpentine season showed a constant decrease in l-pimaric acid content with the progress of the season. The progressive change in l-pimaric acid content was followed by means of a volumetric and a gravimetric method based on the Diels-Alder reaction with maleic anhydride.

Determination of diethyleneglycol-monoethyl ether, I. S. SHUPE (*Jour. Assoc. Off. Agr. Chem.*, 24 (1941), No. 4, pp. 936-944).—Diethylene glycol monoethyl ether can be determined by conversion into its potassium xanthate, extraction of the xanthate, and titration with iodine. The xanthate may be isolated for identification as a pale-yellow crystalline substance melting at from 86° to 88° C. and having the theoretical iodine equivalent and calculated molecular weight.

- **Potassium determination by the cobaltinitrite method as affected by temperature and pH,** L. BURKHART. (N. C. Expt. Sta.). (*Plant Physiol.*, 16 (1941), No. 2, pp. 411-414, figs. 2).—The author found that the precipitating medium should be maintained at 10° C. and pH 6 for the rapid determination of potassium by the cobaltinitrite method. Potassium standards should be prepared in buffer systems at the same pH as the extracts being examined. Under these controlled conditions of temperature and pH, a readable concentration range of from 2 to 200 p. p. m. of potassium is attained. Turbidity measurements are satisfactorily made by the photoelectric method, the proper color filter being used.

Rapid determination of potassium with dipicrylamine, W. O. WILLIAMS. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 47-50).—A modified procedure using only one reagent, lithium dipicrylamine, in addition to the KCl solution utilized in standardization is described. The K contents of 50 ash solutions from cane samples of *Vitis vinifera* were determined by the chloroplatinate and the dipicrylamine methods, standardizing both against the same sample of pure KCl. The averages were 0.527 and 0.523 percent K, respectively. The dipicrylamine method was very much more rapid.

The determination of K₂O in commercial fertilizers using 95 percent and 80 percent alcohol and acid alcohol, C. W. HUGHES and O. W. FORB. (Ind. Expt. Sta.). (*Amer. Fert.*, 95 (1941), No. 5, p. 22).—In potassium chloride there

is as much as 0.3 percent more K_2O found when 95-percent alcohol and acid alcohol are used as with 80-percent alcohol and acid alcohol, as in the present A. O. A. C. method for K_2O in fertilizers.

The determination of selected chemical characteristics of soil which affect the growth and composition of plants, G. R. NOGGLE and F. L. WYND. (Univ. Ill.). (*Plant Physiol.*, 16 (1941), No. 1, pp. 39-60).—The authors offer a systematized and rather complete compilation of methods for the sampling, the chemical analysis, and the physical examination of soils, and the calculation of the results in terms of the constituents, properties, and relationships affecting the physiology of the plant. Volume weight rather than an arbitrary assumption of the weight of an acre-foot of soil is taken as the basis for expressing analytical data in terms of pounds to the acre. Under the heading of water relationships are given methods for moisture and water-holding capacity determinations and for calculating the percentage of the water-holding capacity under field conditions. Under the heading of acidity relationships, pH and lime requirement are to be determined. Colloidal relationships measured include total base exchange capacity, total replaceable bases, percentage base saturation, replaceable hydrogen, individual replaceable bases, exchangeable hydrogen by titration (based in part on Parker's (E. S. R., 60, p. 112) method), and organic colloid base exchange capacity (Olson and Bray's (E. S. R., 81, p. 479) procedure). The nitrogen determinations included total nitrogen, ammonia, nitrate, and organic nitrogen. Systematic separations of the important elements in water extracts and in dilute acid extracts are also provided for, and under the general head of carbon are grouped methods for determining carbonates, organic carbon by combustion and by the Walkley and Black procedure (E. S. R., 70, p. 742), and loss on ignition. Analytical methods recommended for examination of the extracts included a volumetric method for determining potassium as cobaltinitrite, essentially that of Wilcox (E. S. R., 81, p. 326), and two gravimetric methods—a method based on Kolthoff's zinc uranyl acetate reagent (E. S. R., 58, p. 608) for sodium determination and a modification of the Denigès colorimetric method (E. S. R., 44, p. 611) for phosphates.

Colorimetric determination of phosphorus in soils: Provision for eliminating the interference of arsenic, M. S. SHERMAN. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 2, pp. 182-185).—A rapid and accurate colorimetric method for the determination of phosphorus in soils is described. The soil is digested with 60 percent perchloric acid which quickly destroys the organic matter and converts the phosphorus present to the inorganic form. A final boiling temperature of 203° C. is credited with completing the extraction of the soil phosphorus. An aliquot of the perchloric acid solution of the soil is treated with ammonium molybdate and 1,2,4-aminonaphtholsulfonic acid, the Fiske and Subbarow reducing agent (E. S. R., 55, p. 310).

The depth of the blue color formed is measured in the photoelectric colorimeter. An excess of sodium bisulfite in the presence of perchloric acid at room temperature reduces any arsenates to arsenites which do not interfere.

It is noted that although perchloric acid digestion had been used in the determination of phosphates in organic substances by Gieseking, Snider, and Getz (E. S. R., 75, p. 153) and in various analytical procedures, it had not previously been used for soil analysis.

Determination of sulfur: Accuracy and precision of several methods, W. RIEMAN III, and G. HAGEN. (Rutgers Univ.). (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 2, pp. 150-151).—This paper describes the results of determinations of sulfur in known mixtures of sodium sulfate and sodium chloride by several well-known methods. Sodium chloride was chosen as the

foreign salt because it is often present in solution when barium sulfate is precipitated for the determination of sulfur. Substitution of the nitrate ion for the chloride ion showed that nitrate ion is extensively coprecipitated by barium sulfate and introduces a positive error. The most accurate results were obtained by the addition of the precipitant all at once to a solution of rather high activity.

A rapid method for determining hydrocyanic acid content of single plants of Sudan grass, P. G. HOGG and H. L. AHLGREN. (Miss. and Wis. Expt. Stas.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 2, pp. 199-200).—The method consists in placing 0.15 gm. of green plant material, cut into short pieces or macerated, in a test tube, adding 3 or 4 drops of chloroform, and suspending a strip of moist filter paper saturated with sodium picrate solution above the mixture. The saturated filter paper is held in place with a cork stopper. The tube with contents is incubated at room temperature (20 °C.) for from 12 to 24 hr. The sodium picrate is reduced to a reddish compound in proportion to the amount of hydrocyanic acid evolved. The color produced is dissolved by placing the paper in a clean test tube containing 10 cc. of distilled water, after which the color of the water is matched with color standards. The test is sufficiently near quantitative to serve as a basis for the selection of plants low in hydrocyanic acid.

Better orchard spray from study of residue (*Pennsylvania Sta. Bul.* 414 (1941), p. 37).—Chemical investigations of spray deposits to determine the effectiveness of spray materials, by which tests some of the time-consuming and costly field testing can be eliminated, are reported upon by E. H. Frear, H. N. Worthley, and H. W. Thurston, Jr.

Concentration of vitamin A by adsorption, L. A. SWAIN (*Canad. Chem. and Process Indus.*, 25 (1941), No. 12, pp. 684, 698).—Preliminary trials were made with 71 readily available materials to test their ability in a packed column to adsorb vitamin A from fish-oil unsaponifiable material dissolved in low-boiling petroleum spirits. The degree of adsorption was followed by determining the blue value of the eluate, obtained by washing out any adsorbed material with the pure solvent, or by observing the fluorescence of the adsorption column under ultraviolet light. From the results of these trials the materials are listed in several groups, namely, those that showed no attraction for the vitamin A; those that destroyed the vitamin, possibly because of the oxygen adsorbed on them; those that permitted the vitamin to pass through but with considerable loss; and those that showed useful adsorptive properties. In the latter group were included calcined alumina, calcium hydroxide, tri-basic calcium phosphate, infusorial earth, basic magnesium carbonate, silicic acid, sodium benzoate, sodium sulfate, sodium sulfite, and powdered sugar.

The Carr-Price reaction of the carotenoids and its significance to chemical measurement of vitamin A, T. K. WITH (*Ztschr. Vitaminforsch.*, 11 (1941), No. 3, pp. 228-233; *Ger., Fr. abs.*, p. 232).—It is pointed out that the reaction of carotenoids with the Carr-Price reagent is an important source of error in the determination of vitamin A by this method. Even when a correction is introduced for this error it can be done only with rough approximation unless the nature and the proportion of the carotenoids present are known. When the carotenoid concentration is great as compared with that of vitamin A the error of the calculated correction may be considerable.

A simple method for B₁ determination, H. H. BUNZELL (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 3, pp. 279-280, figs. 2).—The principle involved is the stimulation of yeast by vitamin B₁ as described by Schultz, Atkin, and Frey (*E. S. R.*, 79, p. 11). The reaction is carried out in an apparatus similar

to one used for oxidase determinations, but adjusted for measurements of increased pressure with the manometer calibrated to indicate directly the weight of carbon dioxide produced. The method, which is described as to apparatus and procedure, is comparatively simple and rapid, giving reliable results with very small amounts of material. It is possible to determine 0.01 μ g. of vitamin B₁ with fair accuracy.

Further studies on the cyanogen bromide method of estimating nicotinic acid in biological materials, M. SWAMINATHAN (*Indian Jour. Med. Res.*, 29 (1941), No. 2, pp. 325-340, figs. 3).—This study, involving changes in the method as first described by the author (*E. S. R.*, 80, p. 131), was particularly concerned with the choice of aromatic amine and the influence of various methods of extraction and hydrolysis on the value obtained for nicotinic acid content. For development of color with nicotinic acid, using cyanogen bromide and an aromatic amine, three different procedures were described, these involving color development (1) in the cold in aqueous solution, (2) in aqueous solution after preliminary heating with CNBr, and (3) in alcoholic solution after preliminary heating with CNBr. Aniline, *p*-aminoacetophenone, β -naphthylamine, and metol were used in each of the above processes. Aniline was found to have many advantages over other amines, since it was cheap, highly soluble in the solvents under the experimental conditions, and at the same time gave colors as intense or more intense than those given by other aromatic amines. The influence of different methods of extraction—during hydrolysis with (1) aqueous NaOH, (2) alcoholic NaOH, (3) aqueous H₂SO₄, and (4) alcoholic H₂SO₄—was investigated in tests on whole material (maize, wheat, rice, rice polishings, millet, and dried brewers' yeast), aqueous extracts, and the residue left after water extraction. Whatever the method, the values obtained with the various foodstuffs were similar when aniline and β -naphthylamine were used, but lower values were usually obtained when *p*-aminoacetophenone was employed. Estimations of nicotinic acid could not be carried out on alcoholic extracts of urine because of the development of red colors from the interfering substances present.

The effect of ingestion of nicotinic acid on the determination of thiamine in urine by the thiochrome method, H. L. MASON and R. D. WILLIAMS (*Jour. Biol. Chem.*, 140 (1941), No. 2, pp. 417-422).—Attention is called to a source of error in thiamin determinations in urine by the thiochrome method in a nonthiochrome fluorescence which varies with the intake of nicotinic acid. When the intake is that of an ordinary diet and the daily excretion of thiamin is more than 100 μ g., the contribution of nonthiochrome material to the total fluorescence is seldom any greater than the physiological variations in the thiamin excreted and the errors inherent in the method, but if therapeutic doses, 300-500 mg. daily, of nicotinic acid have been administered, the resulting nonthiochrome fluorescence is of sufficient magnitude to render determinations of thiamin excretion by this method meaningless, the blanks in some cases being larger than the thiamin values. The possibility of obtaining a true blank value by destroying the thiamin in a sample of urine with sulfite is being tested.

A bacterial assay method for nicotinamide and related substances in blood, urine, and spinal fluid, H. ISBELL, J. G. WOOLEY, R. E. BUTLER, and W. H. SEBRELL (*Jour. Biol. Chem.*, 139 (1941), No. 2, pp. 499-510).—The procedure described is based upon the growth response of *Shigella paradysenteriae* to supplementation of the basal medium (containing glucose, mineral salts, and thiamin hydrochloride) with nicotinamide or related compounds. Tubes containing the basal medium and from 1 to 5 cc. of diluted blood, urine, or other material, prepared as described, are inoculated with the test organism and

incubated for from 16 to 22 hr. at 31° C., and the turbidity development as an index of growth response is measured in a photoelectric photometer. Readings similarly obtained from a series of nicotinamide standard tubes are used to construct a curve from which the response elicited by an unknown sample is evaluated by interpolation.

The method was found to be sensitive to several hundredths of a microgram of nicotinamide and related compounds, to give values reproducible to within ± 10 percent, and to permit recoveries of added nicotinamide to within ± 10 percent. Urinary values for 11 normal men, and 9 apparently healthy female inmates of a mental institution, indicated, respectively, daily excretions of from 1,800 to 4,000 and from 1,090 to 4,970 "microgram equivalents to nicotinamide;" the daily excretion in normal dogs varied from 335 to 1,095 μg equivalents per day. Blood levels in 66 of the female inmates varied from 590 to 930 μg equivalents per 100 cc. of blood, while spinal fluid levels in 10 of these subjects varied from 8 to 12 μg equivalents. In dogs the blood and spinal fluid levels varied, respectively, from 649 to 1,240 and from 12 to 35 μg equivalents per 100 cc.

The determination of ascorbic acid in foodstuffs containing SO_2 , L. W. MAPSON (*Chem. and Indus.*, 60 (1941), No. 45, p. 802).—Two simple procedures are suggested for the removal of SO_2 which interferes, through reduction of the indophenol dye, with the determination of ascorbic acid. In one method the SO_2 is removed from the 5 percent metaphosphoric acid extract of the food by means of a current of nitrogen and exhaustion in vacuo. In the second method acetone is added, to a concentration of 20 percent, to the metaphosphoric acid extract prior to titration to form the acetone-bisulfite complex which does not reduce the indophenol dye.

The determination of ascorbic acid and sulphur dioxide in fruit juices, H. F. W. KIRKPATRICK (*Jour. Soc. Chem. Indus., Trans.*, 60 (1941), No. 8, pp. 226-229, fig. 1).—It was found that SO_2 caused no interference with the dichlorophenolindophenol titration of ascorbic acid in citrus fruit juices, provided that the end point was taken when the pink tinge persisted for 10 sec. High concentration of acid gave rather higher results which were in closer agreement with those determined by the iodometric method. For the latter method a calculated correction may be applied where only sucrose is present, but such correction is impracticable where hexoses are present, since a large proportion of the SO_2 no longer reacts with iodine. A separation method is described which enables an accurate and rapid determination of both the ascorbic acid and SO_2 to be made in one operation.

Über die quantitative Bestimmung von Vitamin C im Harn, II [Quantitative determination of vitamin C in the urine], T. NAGAYAMA, T. TOMOI, and T. SAGARA (*Biochem. Ztschr.*, 307 (1941), No. 2, pp. 107-119).—A slight modification of the previously noted method (E. S. R., 84, p. 439), which is said to prevent reaction of the reagent with thiosulfate, is described. This consists in introducing just before the titration an additional treatment of 10 cc. of the solution with 2 cc. of 50 percent sodium acetate, followed by another 2 cc. of 20 percent metaphosphoric acid. This additional treatment serves to adjust the pH to 4.5.

A colorimetric test for vitamin K_1 , F. IREVERRE and M. X. SULLIVAN (*Science*, 94 (1941), No. 2447, pp. 497-498).—The test described involves the reaction in alcoholic solution of vitamin K_1 with sodium diethyl dithiocarbamate and alcoholic alkali to give a deep cobalt blue color, attaining its highest intensity in 5 min. and slowly fading after 8 min. The test, which may be applied quantitatively, is sensitive to 0.01 mg. of vitamin K_1 per 2 cc. of 95 percent alcohol (5% per cubic centimeter). The color intensity is fivefold that developed

in Dam's test. The cobalt blue color obtained by reaction with the reagent was also given by 2,3-dimethyl-1,4-naphthoquinone, but not by other naphthoquinones which reacted to give pink, red, green, brown, or violet colors.

Preparation and estimation of crude citrin solutions (vitamin P) from lemons. A. J. LORENZ and L. J. ARNOLD (*Food Res.*, 6 (1941), No. 2, pp. 151-156, fig. 1).—The extract was prepared by simple aqueous extraction of lemons. These were sliced, covered with water, heated to boiling, and boiled for 10 min., the solution then being strained and made up to volume. The crude extract was standardized by treatment of a 5-cc. aliquot with 0.4 cc. of 25 percent KOH solution, followed by heating on the water bath for 10 min. The deep red color developed was compared with that of 0.05 N iodine as a standard. Preliminary standardization of the iodine solution against a solution of a pure citrin preparation, in the concentration of 1 mg. per cubic centimeter, showed that it was necessary to heat the citrin-KOH solution for only 2 min., and that for satisfactory colorimetric matching of the red-yellow iodine color with the red of the citrin solution it was necessary to set the iodine solution at 15 mm. on the colorimeter scale. Under these conditions the citrin equivalent factor of the iodine standard was 1.19. Eleven crude extracts from varying amounts of fresh lemons were tested. The citrin concentrations ranged from 1.32 to 2.40 and averaged 1.77 mg. per gram of whole lemon.

AGRICULTURAL METEOROLOGY

Monthly Weather Review, [January-February 1942] (*Mo. Weather Rev. [U. S.]*, 70 (1942), Nos. 1, pp. 1-21, pls. 11, figs. 3; 2, pp. 23-41, pls. 11, fig. 1).—In addition to meteorological, climatological, solar radiation, and sunspot data these numbers contain the following contributions: No. 1, On a Hypothesis Concerning the Normal Development and Disintegration of Tropical Hurricanes, by W. F. McDonald (pp. 1-7); and No. 2, Observations of Radiation Penetration Through Snow, by I. F. Hand and R. E. Lundquist (pp. 23-25).

Climatological survey for Ohio and Wooster, 1941, J. T. McCLURE (*Ohio Sta. Bimo. Bul.* 215 (1942), pp. 83-84).—The data are summarized and tabulated.

SOILS—FERTILIZERS

[Soil and fertilizer investigations by the Illinois Station] (*Illinois Sta. Rpt.* 1938, pp. 13-37, figs. 13).—The work reported includes a study of slick spots or scalds, by R. S. and G. D. Smith; absorptive powers of soil types, by R. S. Smith and R. S. Stauffer; pasture fertilization, by F. C. Bauer, A. L. Lang, C. H. Farnham, and H. J. Snider; need of conservation practices as emphasized by the Morrow plats, by Bauer, Lang, and Farnham; increases in soil productivity resulting from combining residues, by Bauer, Lang, C. J. Badger, L. B. Miller, Farnham, P. E. Johnson, and L. F. Marriott; reduction in corn yields on cessation of manuring, by Bauer, Lang, Snider, Badger, Miller, Farnham, Johnson, and Marriott; residual value of limestone and potash, by Bauer, Lang, Badger, Miller, Farnham, Johnson, and Marriott; increased wheat yields from new phosphate carriers, by Bauer and Miller; and moderately fine limestone most economical in Illinois, by E. E. DeTurk.

[Soil investigations by the Pennsylvania Station] (*Pennsylvania Sta. Bul.* 414 (1941), pp. 16-18).—Loss of fertility of cultivated as compared with unbroken soils is reported upon by R. B. Alderfer and F. G. Merkle, and the need of Volusia soil for balanced fertilizer and the permanent fertility of grassland, both by J. W. White.

[Soil investigations by the South Dakota Station]. (Partly coop. U. S. D. A.). (*South Dakota Sta. Rpt. 1941*, p. 3-4, 86-88).—Effects of crop production upon soil phosphorus and nitrogen and experiments to determine whether crop residues increase availability of plant food are both reported upon by L. F. Puhr and R. Arms. A cooperative project is noted on soil erosion control in South Dakota.

[Soil investigations by the Wisconsin Station] (*Wisconsin Sta. Bul. 455* (1942), pp. 39-45, 78, figs. 2).—Advantages of long rotations on light soil are reported upon by E. J. Delwiche and A. R. Albert; important residual effects of fertilizer in Marshfield area, by L. Nelson, Albert, and H. D. Reid; need of phosphate and potash on sandy soils, and response of shallow Door County soils to good management, both by Albert; yields of crop on terraces, by H. Ahlgren, F. V. Burcalow, J. J. Pierre, and J. Sund (coop. U. S. D. A.); determination of the nature of clays, by M. L. Jackson and N. N. Hellman; and development of a simple test for organic matter, by S. A. Wilde and W. E. Patzer.

Soil organic matter: Its nature and importance, S. A. WAKSMAN, F. E. BEAR, H. R. COX, J. S. JOFFE, J. W. SHIVE, H. B. SPRAGUE, and V. A. TIEDJENS (*New Jersey Stat. Cir. 422* (1942), pp. 16, figs. 4).—This is a popular treatment of the practical aspects of the subject, mostly in the form of questions and answers.

Apple soils and their management in south Jersey, O. W. DAVIDSON (*New Jersey Stat. Cir. 425* (1942), pp. 8, figs. 3).—This circular emphasizes especially the importance of a suitable choice of soil, orchards on soils considered good for this use averaging 380 bu. per acre in 1940, those regarded as on fair soils 303 bu., and those on soils poorly adapted to this crop only 120 bu. per acre. In a diagrammatic representation of the profiles of soils of the three ratings with respect to apple production, the good soil is shown as having a sandy loam to loam surface layer of a depth of 1 ft. or a little more; a second layer from the depth of about 1 ft. to the depth of about 3 ft. heavier than surface soil, well drained, uniformly colored, brown to red brown; and a third layer of yellow brown to red brown sand or crumbly clayey sand. The soil described as fair consists of a surface layer of loamy sand to loam, a second layer like that of the better soil but only about 1 ft. in thickness, and a third layer as in the good soil. The poor-dry soil has about 1 ft. of sand to sandy loam in its first layer underlain by sand to clayey sand. The poor-wet profile shows about a foot of loamy sand to clay loam underlain by about 2 ft. of poorly drained or dense gravelly sandy clay to clay spotted or streaked with gray, blue gray, or green, and this in turn by sand to sandy clay. Subsoil moisture supply is also pointed out as important. The general soil requirements for apples are briefly discussed. The warning is given that apple land is selected, not made. The classification of soils with reference to apple growing as above outlined is described, and soil management recommendations are offered.

Soil and field-crop management for northwestern New York, A. F. GUSTAFSON ([*New York*] *Cornell Sta. Bul. 777* (1942), pp. 32, figs. 19).—This bulletin, one of a series on soil and field crop management in New York State (E. S. R., 85, p. 20), deals with an area of relatively low elevation between Lakes Erie and Ontario on the north and the base of the Alleghany Plateau border on the south, and extends from the Pennsylvania State line along Lake Erie to the eastern edge of Oneida County. For this area the author takes up the climate, general topography and drainage, transportation facilities, markets, soil maps and related publications, and agriculture; the soils, including muck soils and lime needs; soil erosion, including recommended methods for its control; the

production of farm manure (recommended use, fertility experiments, and fertilizer recommendations); and rotation of crops.

Some physical and chemical properties of the principal orchard soils in the eastern Panhandle of West Virginia, G. M. BROWNING and R. H. SUDDS. (Coop. U. S. D. A.). (*West Virginia Sta. Bul. 303 (1942), pp. 56, figs. 27*).—The vertical root distribution is limited almost entirely by the depth of the soil. In the shallow soils derived from sandstone and shale the roots are limited to an average depth of less than 4 ft. In the deeper limestone soils roots penetrated to a depth of 9 ft. or more. A few commercial apple and peach orchards are being operated with a fair degree of success on the relatively shallow sandstone and shale soils. The location of new orchards on any other than the deeper phases of the shallow soils derived from sandstone and shale cannot be generally recommended, however, and then good soil management should be exercised.

Compared with that of an undisturbed sod, the organic matter content has been reduced materially by cultivation, together with the percentage of the larger-sized aggregates, the noncapillary porosity, and the infiltration rate. Volume weight and the dispersion ratio have been increased. The soils derived from limestones were higher in moisture equivalents, organic matter contents, aggregates greater than 0.25 mm., particles less than 0.05 mm., and lower in dispersion ratios and in particles greater than 0.25 mm. than were the soils derived from sandstone and shale, except that the organic matter content of the subsoils was not significantly different. Emphasized as of special importance are organic mulches or adequate vegetal cover to protect the surface soil from the beating action of rain which brings the soil particles into suspension either to be lost as run-off or to clog the surface pores, in either case increasing the losses of soil and water. Orchards which have been in sod continuously have automatically maintained structural conditions conducive to the rapid infiltration of water with little, if any, loss of soil. Cultivation tends to deplete the fertility of the soil and is destructive of its desirable physical properties, thereby increasing the susceptibility of the orchard site to losses of water and of soil and the liability of the trees to injury by drought.

The application of commercial nitrogenous fertilizers to Berks silt loam soil is profitable, P. T. GISH (*Virginia Sta. Bul. 337 (1942), pp. 12*).—A fertilizer and rotation experiment and results of local application in the southwest Virginia area are reported. The plats were located on a soil low in organic matter and, because of its impervious nature and proximity to bedrock, extremely susceptible to drought injury of crops growing on it in dry seasons. The soil is strongly acid, and even the well fertilized areas have not made satisfactory crops without lime.

Commercial fertilizer report for 1941, A. H. KRUSE, W. E. CARLSON, and A. R. PATTON (*Montana Sta. Bul. 402 (1942), pp. 11*).—The fertilizer law of the State is discussed in part 1, fertilizers in part 2, and the 1941 analytical report in part 3.

AGRICULTURAL BOTANY

Plant material introduced by the Division of Plant Exploration and Introduction, Bureau of Plant Industry, January 1 to March 31, 1937 (*U. S. Dept. Agr., Inventory 130 (1942), pp. 127*).—This number lists more than 4,000 introductions of plant material, with descriptive notes in many cases, "which is nearly twice as many as have ever been received before during a like period."

[Botanical studies] (*Kans. Acad. Sci. Trans., 44 (1941), pp. 128-157, 164-171, 184-189, 202-207, figs. 5*).—The following are of interest to agricultural botany: Preliminary Investigation on the Translocation of Food Between Vegetative Or-

gans and Fruit in the Wheat Plant, by J. C. Bates (pp. 128-129), Myxomycetes of Kansas, I, by T. E. Brooks (pp. 130-157), and Kansas Botanical Notes, 1940, by F. C. Gates (pp. 170-171) (all Kans. State Col.) ; Influence of Time of Cultivation on the Control of Field Bindweed, *Convolvulus arvensis* L., by J. C. Frazier (pp. 164-169), and Plant Succession on Land in Continuous Alfalfa Culture as Influenced by Fertilizer Treatments, by W. H. Metzger and K. L. Anderson (pp. 184-189) (both Kans. Expt. Sta.) ; and Preliminary Report on Periodicity and Rhythmicity of Mitotic Phases of Root Tips Under Varying Light Conditions—I, *Allium cepa* L., by M. D. Solomon and J. A. Trent (pp. 202-207.)

Division of Plant Biology, H. A. SPOEHR ET AL. (*Carnegie Inst. Wash. Yearbook, 40 (1940-41), pp. 147-185, figs. 2*).—Progress reports are included on the results of fundamental investigations of photosynthesis said to be of such significance that virtually all hypotheses thus far advanced to account for its mechanism must be abandoned or drastically revised; on experimental taxonomy approached from the morphologic, geographic-ecologic, genetic, and cytological standpoints; studies of the conditions determining the types of vegetation found growing naturally in uncultivated areas; and paleobotanical investigations as providing a historical viewpoint for botany.

The more detailed reports cover: Biochemical Investigations, by H. A. Spoehr, J. H. C. Smith, H. H. Strain, and H. W. Milner (pp. 151-157), including studies of the organic nutrition of plants, use of radioactive CO₂ in photosynthesis, the state of pigments in leaves, isomerization of carotenoid pigments and olefinic fatty acids, and oxidation-reduction reactions in leaves; The Quantum Efficiency of Photosynthesis, by R. Emerson and C. M. Lewis (pp. 157-160); Experimental Taxonomy, by J. Clausen, D. D. Keck, and W. M. Hiesey (pp. 160-170), including criteria for relationship, relationships in the genus *Layia* with a possible new species, synthesis of pre-existing species of *Madia*, and miscellaneous investigations; Desert Investigations, by F. Shreve (pp. 170-172), covering the Chihuahuan and Sonoran deserts; Ecology, including adaptation and origin, by F. E. Clements, F. L. Long, and E. V. Martin (pp. 172-176), and climate, climax, and conservation, by F. E. and E. S. Clements (pp. 176-182); and Paleobotany, by R. W. Chaney (pp. 182-185). There are 34 references.

Plankton as a source of food, N. POLUNIN (*Nature [London], 148 (1941), No. 3744, p. 143*).—This is a note on the possibility of using plankton, and especially fresh water phytoplankton, for plant nutrition.

A new petri dish cover and technique for use in the cultivation of anaerobes and microaerophiles, J. H. BREWER (*Science, 95 (1942), No. 2475, p. 587, fig. 1*).—By this method an anaerobic lid, so designed that it touches the agar at the periphery and results in trapping a small amount of air over the agar surface, is placed on the petri dish as soon as the medium has solidified. The reducing agent in the anaerobic medium soon uses up the O₂ in this small amount of air and an anaerobic condition then exists.

Determinación de bacterias termófilas en azúcares [Determination of thermophile bacteria in sugars], A. M. DE SORIANO and L. A. GARASSINI (*Rev. Argentina Agron., 9 (1942), No. 1, pp. 28-38, figs. 2; Eng. abs., p. 36*).—The results of analyses of 100 samples of white granulated sugar purchased from stores in different parts of Buenos Aires denoted the presence of three groups of sporuliferous thermophiles, which were studied. There are 31 references.

Preparation and properties of the amylases produced by Bacillus macerans and Bacillus polymyxa, E. B. TILDEN and C. S. HUDSON (*Jour. Bact., 43 (1942), No. 4, pp. 527-544, figs. 8*).—Study of a considerable number of cultures of *B. macerans* showed that all developed the unique amylase capable

of converting starch into the nonreducing crystalline dextrans. The amount of enzyme produced varied from culture to culture, a few being outstanding in their enzyme activity. Cultures of *B. polymyxa* also exhibited a quantitative variation in the elaboration of a type of amylase similar to those already known. Optimum conditions were established for producing these two enzymes, the properties of which are described, and the iodine test for crystalline dextrans was shown to be a simple and reliable one for distinguishing the two bacterial species. Preparation of the amylases is a relatively simple and inexpensive procedure, and the conditions established for their maximum production and starch hydrolysis provide a basis for their possible commercial usefulness. The *B. macerans* enzyme, in particular, is believed also to have many theoretical applications to carbohydrate chemistry which merit consideration.

An experimental study of the influence of temperature on the bactericidal activities of alcohols and phenols, F. W. TILLEY. (U. S. D. A.). (*Jour. Bact.*, 43 (1942), No. 4, pp. 521-525).—Studying the bactericidal efficiencies of phenol, orthocresol, paracresol, orthobutylphenol, parabutylphenol, resorcinol, ethyl alcohol, and *n*-butyl alcohol against *Staphylococcus aureus* and *Eberthella typhosa*, the experimental evidence indicated that the effect of temperature varies with each disinfectant and each test organism.

The occurrence of bacteriostatic and bactericidal substances in the soil, S. A. WAKSMAN and H. B. WOODRUFF. (N. J. Expt. Stas.). (*Soil Sci.*, 53 (1942), No. 3, pp. 233-239).—Summarizing the results of various studies in this field (20 references), it has been found possible, using proper extracting agents (ether), to demonstrate that soils contain substances of the actinomycin type, which inhibit growth of certain bacteria in culture media. These substances when isolated from the soil have not only a bacteriostatic but also a bactericidal action on certain bacteria. Added to the soil in concentrations much higher than would be necessary to inhibit bacteria in artificial media, actinomycin is rendered ineffective against these bacteria. Soils, peats, and composts contain a substance (α -humus) that reduces considerably the activity of actinomycin, even in artificial media.

Studies in antibiosis between bacteria and fungi.—II, Species of *Actinomyces* inhibiting the growth of *Colletotrichum gloeosporioides* Penz. in culture, C. J. ALEXOPOULOS (*Ohio Jour. Sci.*, 41 (1941), No. 6, pp. 425-430).—A continuation (E. S. R., 80, p. 350). In testing 80 different *Actinomyces* from the Centraalbureau voor Schimmelcultures (Baarn, Netherlands) against a single-spore isolate of *C. gloeosporioides*, in culture, the former fell into three groups, viz, strong inhibitors, weak inhibitors, and noninhibitors. Furthermore, the growth of *C. gloeosporioides* was greatly inhibited by filtrates taken from strong inhibitors, but not at all by filtrates from the weak inhibitors or noninhibitors. It is believed that this inhibition is due to a toxic substance, and several theories are proposed to explain the facts observed.

Studies in antibiosis between bacteria and fungi.—III, Inhibitory action of some actinomycetes on various species of fungi in culture, C. J. ALEXOPOULOS and J. A. HERRICK (*Bul. Torrey Bot. Club*, 69 (1942), No. 4, pp. 257-261).—Continuing the series noted above, actinomycetes were found to differ in their ability to inhibit the growth of a given fungus under conditions of the test, and also fungi differed in their susceptibility to inhibition by a given species of *Actinomyces*. The degree of inhibition was thus a function of both the fungus and the inhibiting organism. No correlation seemed to exist between the normal growth rate of a fungus and the degree of its inhibition by a particular *Actinomyces*. There was some evidence that some of the *Actinomyces* species used may be manufacturing growth-promoting material in addition to or instead of growth-inhibiting substances.

A new antibacterial agent produced by a mould, G. A. GLISTER (*Nature [London]*, 148 (1941), No. 3755, p. 470).—A mold, probably an *Aspergillus* species, was found to produce a powerful antibacterial agent with chemical properties differing from penicillin and inhibiting growth of both gram-negative and gram-positive bacteria at a dilution of about 1:200,000.

Mycological notes, VI, C. L. SHEAR. (U. S. D. A.). (*Mycologia*, 34 (1942), No. 3, pp. 263-273).—Taxonomic data are presented on species of *Sphaeria*, *Sphaeronema*, *Odontotrema* (with characterization of genus), *Clypeothecium*, and *Trematostoma*.

Studies in the genus *Heterosporium*, J. É. JACQUES (*Univ. Montréal, Contrib. Inst. Bot.*, No. 39 (1941), pp. 59, pls. 6).—This thesis comprises the results of a morphologic, developmental, and taxonomic study of the fungus genus *Heterosporium*. There are 43 references.

A new yellow *Leptota*, V. K. CHARLES. (U. S. D. A.). (*Mycologia*, 34 (1942), No. 3, pp. 322-324, fig. 1).—*L. aurantiogemmata* n. sp. is described from dead wood.

Zygosaccharomyces nectarophilus n. sp. and *Zygosaccharomyces rugosus* n. sp., A. G. LOCHHEAD (*Canad. Jour. Res.*, 20 (1942), No. 2, Sect. C, pp. 89-91).—The two new species are described.

Novye vidy kartofelia iz urugvaia i argentiny tsennye dlia selektsii (New wild potato species from Argentina and Uruguay), S. M. BUKASOV (*Inst. Rastenievod., Vest. Sotsialist. Rastenievod. (Lenin Acad. Agr. Sci., Inst. Plant Indus., Soviet Plant Indus. Rec.)*, No. 4 (1940), pp. 3-12, figs. 4; *Eng. abs.*, pp. 11-12).—*Solanum henryi*, *S. sortanum*, *S. mercedense*, *S. mechouguense*, *S. milanii*, *S. laplaticum*, *S. boergeri*, and *S. horovitzii* are considered.

Systematics, cytogenetics, and evolution in *Crepis*, E. H. BABCOCK. (Univ. Calif.). (*Bot. Rev.*, 8 (1942), No. 3, pp. 139-190).—This monographic review (132 references) summarizes the papers, published mostly in the past decade, which have some bearing on the systematics of this genus, together with several papers on the cytology which at present have no obvious bearing on systematics.

On the vegetation and plant resources of Colombia, A. DUGAND (*Chron. Bot.*, 7 (1942), No. 2, pp. 71-75).

Natural resources of Venezuela, L. WILLIAMS (*Chron. Bot.*, 7 (1942), No. 2, pp. 75-77).—A brief summary referring especially to economic plants such as coffee, cacao, corn, wheat, rice, beans, tobacco, cassava, sugarcane, forests and forest products, rubber, insecticidal plants, etc.

The desert vegetation of North America, F. SHREVE (*Bot. Rev.*, 8 (1942), No. 4, pp. 195-246, fig. 1).—This is a comprehensive review (over two pages of references) considering desert vegetation, including life forms of the desert and the structure and floristic composition of desert vegetation; and the geographical area of the North American desert, with brief descriptions of the features which differentiate its several parts, together with brief discussion of the arid regions of southern Mexico.

Ecologic notes on Florida hawthorns [*Crataegus* spp.], W. A. MURRILL (Fla. Expt. Sta.). (*Ecology*, 23 (1942), No. 1, pp. 121-123, figs. 3).

Grass seedling establishment, and productivity—overgrazed vs. protected range soils, S. K. McILVANIE. (U. S. D. A. coop. Univ. Ariz.). (*Ecology*, 23 (1942), No. 2, pp. 228-231, figs. 5).—A greenhouse study was made of undisturbed samples of overgrazed and protected soils to determine seedling establishment of *Eragrostis lehmanniana* and *Panicum antidotale*, and pot tests of productivity were conducted with the two grasses plus corn and sunflower. Successful establishment was obtained on bare overgrazed soils, but no seeds germinated on the protected soils. The less viable but fine *Eragrostis* seeds became incorporated into the overgrazed soil through the action of the artificial rain, whereas the

more viable but large *Panicum* seeds remained on the surface, which may account for the more successful establishment of the former. On the protected soils a covering of algae and mosses prohibited contact with the mineral soil, preventing germination of both grasses apparently through drying of the seeds. Pot tests with four different kinds of plants showed the protected soils to be twice as fertile as the overgrazed in terms of dry weight produced. The role of ants in influencing artificial and spontaneous reseedling on overgrazed ranges may be important and is believed worthy of further investigation.

The relative efficiency of strains of *Rhizobium trifolii* as influenced by soil fertility, J. L. ROBERTS and F. R. OLSON. (Ind. Expt. Sta.). (*Science*, 95 (1942), No. 2468, pp. 413-414).—In experiments with mammoth red clover and five cultures of *R. trifolii* differences in relative efficiency were observed. It is believed that the present demonstration of cultures especially suited to K-deficient plants has added significance because it suggests the development of commercial inoculants especially suited for legumes to be grown on particular soil types.

Specificity of pyridoxine for excised tomato roots, W. J. ROBBINS (*Amer. Jour. Bot.*, 29 (1942), No. 3, pp. 241-245).—The effects of 12 analogs of pyridoxine on growth of excised tomato roots in presence of thiamin were studied. Acetylation of pyridoxine failed to influence its beneficial action, and the substitution of an ethyl for the methyl group in the second position on the pyridine ring did not reduce the activity. The other 9 analogs were inactive. Pyridoxine has a high degree of specificity for the growth of excised tomato roots.

Transport of thiamin in the tomato plant, J. BONNER (*Amer. Jour. Bot.*, 29 (1942), No. 2, pp. 136-142).—Results of the study indicated that substances interfering with *Phycomyces* assay are not present in tomato leaves. The highest thiamin concentration in the vegetative plant was found in the youngest leaves, becoming progressively lower with each succeeding older leaf. Thiamin accumulated markedly above a girdle made by steaming the tomato stems at the second node and below one made by steaming the stems in the region between the mature and the young rapidly expanding leaves. Roots of decapitated plants from which all axillary shoots had been removed contained more than the roots of those from which axillary shoots had been allowed to grow. Comparative accumulation in girdled petioles of different aged leaves indicated that thiamin may be exported by mature leaves with relatively low concentrations of the substance rather than by young leaves with higher concentrations.

On the nastic and traumatic responses in the pea test, C. L. SCHNEIDER (*Amer. Jour. Bot.*, 29 (1942), No. 3, pp. 201-206, figs. 7).—The chief points establishing the nastic and traumatic causes of the curvatures in the pea test are summarized. These responses to auxin are considered as complementary rather than contradictory. From direct measurement of the effect of injury on growth during optimum auxin treatment, it was found that growth is affected to about the same extent in both pea and oats coleoptiles by the same relative amount of injury. Values for the fraction of the curvature caused by the nastic response of ordinary halved oats coleoptiles and pea stems tended to be well below 0.5. The remainder of the curvature (more than 0.5) is concluded to be of trauma origin. These estimates are supported by a similar analysis from the opposite direction in which a largely traumatic response is used as the standard of comparison.

Sexual hormones in *Achlya*.—III, Hormone A and the initial male reaction, J. R. RAPEE (*Amer. Jour. Bot.*, 29 (1942), No. 2, pp. 159-166, figs. 6).—In continuation (E. S. R., 83, p. 318), techniques are described for culturing the ♀ fungus *A. bisexualis* as a source of hormone A and the preparation of ♂ *A. ambisexualis* as test material for the ♀ hormone, the relationship between hormone concentration and the activity of the ♂ form was determined and is

described, and its reaction as limited by a number of other factors is noted. "The effects of certain pure chemical compounds on the ♂ plant of *A. ambisexualis* and the rate of hormone A production by the ♀ of *A. bisexualis* are described and briefly discussed."

Izmenenie napravlenosti invertazy list'ev pri roste i razviti rastenii (On the alterations of the prevailing direction of invertase action in plants in relation to growth and development), V. I. NILOV and O. N. PAVLENKO (*Biokhimiia*, 5 (1940), No. 1, pp. 33-40; *Eng. abs.*, pp. 39-40).—The original specific biochemical characters of plant leaves, manifesting themselves in a definite range of variation in invertase, are said to be maintained throughout the lifetime of the leaf until it falls. Under environal influences the synthesis : hydrolysis ratio may vary considerably in any one of the leaf tiers, but if the shoot as a whole is considered a regular ratio is retained between the several tiers. On artificial removal of the lower and middle leaves at the beginning of flowering no manifest alterations in the direction of invertase action are observed in the apical leaves, but if the apical leaves are removed at this stage the middle leaves in which hydrolysis is usually predominant tend to show increased synthesizing capacity. In vernalized plants the predominance of hydrolysis in the middle leaves is more clearly marked than in the nonvernalized. In leaves turned yellow and fallen, invertase always displays marked predominance of hydrolyzing activity.

Izmenenie napravlenosti invertazy u list'ev razlichnykh iarusov [Changes in the direction of invertase action in leaves of different level], V. I. NILOV (W. I. NILOW) and O. N. PAVLENKO (PAWLENKO) (*Biokhimiia*, 5 (1940), No. 1, pp. 41-47; *Ger. abs.*, p. 47).—The character of invertase action exhibits regular changes in leaves at different levels on the stem. In the lower leaves hydrolytic activity is weakly expressed, in the middle region it is strongly developed, and in the upper leaves the weakest hydrolytic action, or even synthetic activity, is found.

Aktivnost' i kachestvennye osobennosti katalazy u pshenits, iachmenei i u smezhnykh a pshenitse rodov (The activity and quality (Q_{10} and μ) of catalase in wheats, barleys, and in genera related to wheat), M. I. KNIAGINICHEV and I. U. (J.) K. PALILOVA (*Biokhimiia*, 5 (1940), No. 1, pp. 55-64; *Eng. abs.*, p. 64).—"Each developmental stage in wheats and barleys is characterized by different activity and qualitative indexes (Q_{10} and μ) of catalase. No substantial variations of the temperature coefficient and energy of activation are observed in the course of one day. The significant alterations of the activity, temperature coefficient, and energy of activation of catalase in the leaves in relation to manuring suggest that the variability of these indexes belongs to the adaptive biological properties of the investigated plants. Wheat and barley strains belonging to different ecological groups exhibit no significant variations of the qualitative features (Q_{10} and μ) of catalase. The more ancient genera related to wheat (*Aegilops*, *Haynaldia*, etc.) exhibit higher values of temperature coefficient and activation energy of leaf catalase. Accordingly, these qualitative features of catalase can be made use of for the ascertaining of phylogenetic relationship between different genera."

The influence of temperature on the development of amylase in germinating wheat, E. KNEEN, B. S. MILLER, and R. M. SANDSTEDT. (Nebr. Expt. Sta.). (*Cereal Chem.*, 19 (1942), No. 1, pp. 11-27, figs. 5).—When hard red wheat was germinated at four temperatures, changes occurring at the different levels were found to be quite similar, differing essentially only in the rapidity of change. With germination at 20°, 15°, 10°, and 5° C., about 4, 6, 10, and 24 days, respectively, were required to produce equal levels of sprout length

and amylase activity. The green weight of developing seedlings increased steadily throughout germination, but the total dry weight showed some decrease, which was most pronounced with germination at 20°. Both free and total saccharogenic activity increased progressively throughout germination. Total β -amylase activity showed a slight increase during the first growth stages, followed by a decrease. Increase of free β -amylase was progressive throughout, the free and total activities becoming essentially equal in the later stages. α -Amylase activity, both free and total, increased steadily with seedling growth, essentially paralleling increase in sprout length. Based on original dry weight, there was a very considerable decrease in total β -amylase through the later stages of growth, coincident with a similar increase in total α -amylase. It is suggested that these changes may be closely related. The significance of the data as applied to the production of malt for flour supplementation is discussed. Since the α -amylase content of a malt appears to be the only factor of any appreciable significance in supplementation, it would seem advisable to so regulate malting practice as to bring about the most efficient production of this enzyme.

The distribution and preparation of citrus peroxidase, W. B. DAVIS. (U. S. D. A.). (*Amer. Jour. Bot.*, 29 (1942), No. 3, pp. 252-254).—"The distribution of peroxidase in different tissues of orange, grapefruit, lemon, and tangerine is described, and the high activity in the inner seed coat of these fruits, especially tangerines, is pointed out. Hand-removed seed coats gave the highest activity in crude preparations. That it may be possible to make peroxidase on a large scale is indicated from experiments with lemon seeds, which are available in quantity."

Adventitious roots in stem cuttings of *Tropaeolum majus* L., A. I. SMITH (*Amer. Jour. Bot.*, 29 (1942), No. 2, pp. 192-194, figs. 8).—Adventitious roots in stem cuttings of common nasturtium were studied and are discussed.

"Vegetable staticks" or evidence concerning cell secretion, root-pressure, and gas diffusion in the functioning and morphogenesis of excised plant tissues, P. R. WHITE (*Amer. Sci.*, 30 (1942), No. 2, pp. 119-136, figs. 15).

Internal moisture relations of sugar cane: The selection of a moisture index, H. F. CLEMENTS and T. KUBOTA. (Hawaii Expt. Sta.). (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.]*, 46 (1942), No. 1, pp. 17-35, figs. 3).—In attempting to arrive at a proper approach to an irrigation program, two general avenues are noted: One involves an effort to evaluate all factors affecting the transpirational requirements of a given crop (e. g., soil, air, plant). This is believed too complicated to be practical. The second is based on the simple hypothesis that the moisture level of a crop at any one time results from the interplay of all internal and external factors affecting the water relations of the plant as integrated by the plant itself. In this case the difficult and complicated factors are cared for by the plant itself. To use this method requires a tissue, here denominated the "moisture index," which can be collected periodically and its moisture level determined. As a result of the correlations presented in this study, it is believed safe to conclude that the moisture level of the elongating cane sheaths is a true index to the moisture levels of the growing tissues of the cane plant as well as of the mature millable cane. Since the moisture index has been shown to be reliable not only for small local plots but also for plots started at different times of the year and in different climatic areas, it is presumed that the moisture level observed results from the integration by the plant of all factors, external and internal, affecting the moisture relations. Thus it seems reasonable to suppose that an irrigation program will best fit a particular crop if based on a running picture of the conditions within the plant as portrayed by the moisture index. There are 23 references.

A sensitive humidistat, W. O. WILLIAMS. (Univ. Calif.). (*Science*, 95 (1942), No. 2463, pp. 283-284, fig. 1).—The humidistat described and illustrated possesses a control operated by the differential in temperature between ether-filled wet and dry bulbs, the difference in vapor pressures of ethyl ether contained in the bulbs due to this temperature difference displacing a mercury column across the platinum contacts sealed in the connecting tubing. Approximate adjustment is obtained by varying the amount of mercury in the manometer tube by adding to or subtracting from a reserve supply stored in the bulbs, and final adjustment is made by swinging the instrument about a pivot.

Bibliography of references to the literature on the minor elements and their relation to plant and animal nutrition, L. G. WILLIS (New York: *Chilean Nitrate Ed. Bur., Inc.*, 1942, 3. ed., Sup. 3, pp. 78).—A third supplement to the third edition (E. S. R., 86, p. 23).

The influence of copper and iodine on the growth of *Azotobacter agile*, J. C. LEWIS (*Amer. Jour. Bot.*, 29 (1942), No. 3, pp. 207-210).—An interaction between Cu and I in the early growth stages was demonstrated. The action of Cu appeared to manifest itself in a lengthened lag growth phase, whereas this effect was reduced by I. Such actions should be considered before stimulating effects of I are interpreted as evidence of the essential nature of I in plant or microbiological nutrition.

Comparative nutrient requirements for several types of corn seedlings grown in quartz sand, C. L. WORLEY, E. L. MOORE, and R. G. GROGAN. (Univ. Ga.). (*Jour. Tenn. Acad. Sci.*, 16 (1941), No. 4, pp. 384-400).—Nine strains (several distinct types) were grown through the seedling stage in standardized sand culture with the 21 possible Shive nutrient solutions when based on eighths. From the results obtained, the following tentative conclusions were drawn: In general, the absolute proportions of the elements were more important physiologically than the ratios of one element to another, and the salt proportions required to produce the best physiological balance for the different varieties used differed markedly. Selection of a best solution depended to a degree on the method of assay employed. It was impossible to choose arbitrarily a best solution for one variety even though that solution had been tested and proved a best solution for another variety. Although most investigators have used solutions identical with or similar to R_2S_3 , R_3S_3 , and R_4S_3 , data presented here are believed to indicate that the selection of R_3S_3 would prove more successful for most strains of corn, at least during the seedling stage.

The dissimilation of glucose by *Chaetomium funicola* Cke.—II, Influence of some modifications in the composition of Czapek-Dox medium on the rate of glucose dissimilation, G. SEMENIUK. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 16 (1942), No. 3, pp. 337-348, figs. 3).

Metabolism of organic acids in excised barley roots as influenced by temperature, oxygen tension, and salt concentration, A. ULEICH. (Univ. Calif.). (*Amer. Jour. Bot.*, 29 (1942), No. 3, pp. 220-226, figs. 7).—The total nonvolatile organic acid content of excised roots with ample available sugar supply remained constant unless a change in ionic balance occurred within the roots. When roots absorbed an excess of anions over cations organic acids disappeared, but with the reverse situation the acids were formed. The respiratory quotients reflected these organic acid changes by increasing as the acids disappeared and decreasing when they were formed. Though organic acid formation in barley roots depended on the presence of sugars, the acids were not in a dynamic equilibrium with them, since large decreases in total sugars failed to decrease the acid content of the roots except when the sugars had attained very low concentrations.

Failure to affect the total organic acid content of excised roots by temperature or O_2 tension changes was attributed to lack of influence of these factors on the ionic balance of the root cells. There was no evidence for the idea that the organic acids arise primarily from the oxidative deamination of amino acids. The indirect evidence indicated that the acids were derived from carbohydrates.

Isolation of a new alkaloid from perennial ryegrass, J. MELVILLE and R. E. R. GRIMMETT (*Nature [London]*, 148 (1941), No. 3765, p. 782).—This is a preliminary report on the isolation and properties of a hydrochloride with the empirical formula $C_{10}H_{13}O_2N_4(OCH_3)_4 \cdot 2HCl$, named perloline, from *Lolium perenne*. Several other alkaloids were also found, but data concerning them are at present indefinite.

The significance of oxygen in nutrient substrates for plants.—I, The oxygen requirement, S. G. GILBERT and J. W. SHIVE (N. J. Expt. Stas.). (*Soil Sci.*, 53 (1942), No. 2, pp. 143–152, figs. 4).—Using a method for maintaining an approximately constant O_2 concentration in the nutrient solution and permitting a quantitative study of the relationship of O_2 tension to growth, soybean plants exhibited an approximate O_2 requirement for growth at an O_2 tension (6 p. p. m.) below the point of saturation at its partial pressure in the atmosphere. Below this optimum the plants showed O_2 -deficiency symptoms, whereas above it they exhibited O_2 toxicity. Tomato plants showed a marked increase in growth with increased O_2 supply, the maximum gain in green weight being obtained at the highest concentration (16 p. p. m.) used. Oats also showed the beneficial effects of an adequate O_2 supply by increased growth over that in O_2 -deficient cultures, but no O_2 toxicity was noted in these tests covering a concentration range extending beyond that obtained in air-saturated solutions. It was indicated that the optimum O_2 supply for maximum growth of certain agricultural crops is not attained by saturation of the nutrient substrate by air but is reached with a higher partial pressure of O_2 than is present in the atmosphere.

Passage of air through plants and its relation to measurement of respiration and assimilation, V. F. C. GLASSTONE (*Amer. Jour. Bot.*, 29 (1942), No. 2, pp. 156–159).—Examination of 17 plant species indicated the passage of air through their tissues both in the direction of leaf to root and the reverse. There was an approximate proportionality between the amount passing and the applied pressure, and the results were reproducible. Age, size, and moisture condition of the plant were factors apparently affecting the rate of passage. It is suggested that although individual and specific differences occurred in the ability to allow air passage, those differences are believed to be matters of degree only. The rapid passage of air through plants was demonstrated in connection with measurement of CO_2 produced in respiration.

Freezable water content and the oxygen respiration in wheat and rye grain at different stages of ripening, H. G. SHIRK (Md. Expt. Sta.). (*Amer. Jour. Bot.*, 29 (1942), No. 2, pp. 105–109, figs. 6).—By technics described and comparing the results of 2 years' work with immature rye and wheat, there was no apparent difference between the amounts of water freezable from the respective 1939 grain samples frozen at $-15^\circ C$. and those of 1940 frozen at -25° . As the young green grain of wheat and rye developed and ripened, the free water decreased. At the same time there was a similar time rate decrease in the amount of O_2 taken up in 1 hr. per gram of fresh or dry weight of grain which paralleled the time rate decrease of the freezable water in each case. This same close relationship was shown when respiration data and freezable water results were plotted against total water instead of time. The descending and paralleling respiration and freezable water curves for immature rye and wheat when plotted against time or total water were very closely duplicated in the 2 yr. Both grains

showed a tendency to associate less bound water per gram of dry weight as development and ripening took place. However, this tendency, most pronounced in ripening wheat grain, was relatively small as compared with the loss of free water during the same time, so that there resulted a large shifting of the free-bound water equilibrium.

The respiratory and ripening behaviour of the tomato fruit on the plant, K. A. CLENDENNING (*Canad. Jour. Res.*, 20 (1942), No. 4, Sect. C, pp. 197-203, fig. 1).—Growth was found associated with an absolute increase in respiratory rate. Fruits of all populations showed a marked rise and fall in rate during ripening, and this senescent drift was confirmed in detail by following the respiration of individual fruits ripening while still attached to the plant. Although exhibiting the usual senescent drift as they change color, fruits grown in summer cloth house plats showed a consistently lower respiratory rate than noted in all other populations. It was also shown that the chief path of gaseous exchange of the mature attached fruit is localized at the stem end.

Inhibitory effects of inorganic compounds on photosynthesis in Chlorella, S. S. GREENFIELD (*Amer. Jour. Bot.*, 29 (1942), No. 2, pp. 121-131, figs. 20).—"In tests at high light intensity very low concentration of CuSO_4 , CoSO_4 , and HgCl_2 inhibited photosynthesis, but stronger solutions of ZnSO_4 , H_3BO_3 , $(\text{NH}_4)_2\text{SO}_4$, NiSO_4 , KCl , and KI were required to retard the process. The amount of inhibition tended to vary over a rather wide range of concentrations, but HgCl_2 showed a narrow range between noneffective and completely inhibiting concentrations. The rates of respiration and of subsequent culture growth were not appreciably affected by treatment with concentrations which reduced photosynthesis 50 percent. MgSO_4 , MnSO_4 , and KNO_3 inhibited photosynthesis only at concentrations wherein the high osmotic pressure of the solutions lowered the rate. By means of studies at five different light intensities only the dark reaction was found to be retarded by ZnSO_4 , NiSO_4 , and KCl . The effect of CuSO_4 , H_3BO_3 , and KI was mostly a retardation of the dark reaction and a lesser inhibition of the light stage. CoSO_4 and $(\text{NH}_4)_2\text{SO}_4$ depressed both the dark and photochemical stages of photosynthesis about equally. No substance was found which inhibited only the photochemical stage. Decrease in water content, brought about by suspension of cells in sucrose solutions of high osmotic pressure, caused a retardation of the dark reaction only. Some possible modes of action of these inhibitors are discussed."

The chemical composition of chloroplast granules (grana) in relation to their structure, G. M. BOR (*Chron. Bot.*, 7 (1942), No. 2, pp. 66-67, fig. 1).—A brief critical review.

The photodynamic action of neutral red on root tips of barley seedlings.—I, The effect on frequency of cell division; II, Abnormalities of cells and tissue, E. K. PATTERSON (*Amer. Jour. Bot.*, 28 (1941), No. 8, pp. 628-638, figs. 5; 29 (1942), No. 2, pp. 109-121, figs. 44).

The significance of X-rays in studying the orientation of cellulose in the secondary wall of tracheids, I. W. BAILEY and E. E. BERKLEY. (U. S. D. A. et al.). (*Amer. Jour. Bot.*, 29 (1942), No. 3, pp. 231-241, figs. 18).—The present most reliable means of studying the fibrillar orientations of cellulose in individual layers of tracheids are microscopically visible striations and crystals that may be induced to form in the elongated porosity of the cellulosic matrix of unswollen cells, and the over-all average or dominant arrangement of the crystalline cellulose may be best obtained from X-ray diffraction patterns. The technic and results of such a study are detailed and discussed.

The migration of fungal nuclei in an electric field, E. S. DOWDING and E. H. GOWAN (*Canad. Jour. Res.*, 20 (1942), No. 2, Sect. C, pp. 92-100, figs. 4).—Mycelia

of *Neurospora tetrasperma* readily conducted an electric current. While a current of about 5 μ a. was allowed to pass through cultures of this fungus and *Gelasinospora tetrasperma*, mycelial growth ceased almost entirely, but afterward the fungi grew normally and showed no ill effects. Currents of the order of 1 or 10 μ a. running in either direction through two fused strains of *N. tetrasperma* failed to alter the normal direction of nuclear migration from one strain to another.

Conjugate nuclear division in the fungi, B. O. DODGE (*Mycologia*, 34 (1942), No. 3, pp. 302-307, figs. 2).—This is a general discussion of the subject and its terminology, illustrated by examples and text figures.

Nucleoli and related nuclear structures, R. R. GATES (*Bot. Rev.*, 8 (1942), No. 6, pp. 337-409, fig. 1).—Following an introductory discussion of historical references, this monographic review takes up, in succession, nucleolar extrusion in animal cells, Feulgen staining, nucleoli in lower organisms, modified mitosis, "nucleoli" in virus-infected animal and plant cells, chemical composition of nucleoli, nucleolar size, nucleoli and satellites, the nucleolar cycle in mitosis, the satellite thread, the phylogenetic significance of nucleoli, nucleolar budding, nucleoli in salivary gland cells, and sex chromosomes and nucleoli. There are eight pages of references.

A developmental analysis of cell length as related to stem length, E. A. BINDLOSS (*Amer. Jour. Bot.*, 29 (1942), No. 2, pp. 179-188, figs. 15).—Using genetically tall and dwarf races of tomato and *Zinnia elegans* grown from seeds of essentially equal weight, measurements of series of successive cells were made in embryos, seedlings, and older plants, extending from the apex in a proximal direction. In the embryo and at all later stages, Marglobe tomatoes were always taller than Dwarf Stone, but Giant zinnias were not appreciably taller than Lilliput until flower formation. No difference in meristem size was apparent between tall and dwarf plants. Cell lengths of the first 10 cells in the series, forming the promeristem, decreased as the plants grew older, but these cells were equally long for tall and dwarf varieties. Cells were elongating directly behind the promeristem of both species, but their lengths at successive stages in the plant's development became less as it matured. These shorter vacuolate cells in the older stages of Marglobe tomato were associated with a longer meristematic region, thus accounting for the greater height by making a larger number of cell generations possible. In contrast, embryonic cells of Dwarf Stone were longer because they attained maturity sooner, and thus stopped dividing. There was a series of shifting size relationships of the vacuolate cells in tall and dwarf plants, indicating that tallness and dwarfness are not due to absolute differences in cell length at the apex. Although there were no sharp differences in total height of Giant and Lilliput zinnias, the cell behavior in their respective meristems was essentially the same as in the tomatoes. Thus, while there is no constant relationship of cell length to stem length during vegetative ontogeny, there is nevertheless a fundamental and genetically controlled sequence of changing size relations in the terminal meristems which is ultimately related to differences in cell number and so to differences in plant height. There are 16 references.

The development of the shoot apex and of the primary thickening meristem in *Phoenix canariensis* Chaub., with comparisons to *Washingtonia filifera* Wats. and *Trachycarpus excelsa* Wendl., E. BALL (Univ. Calif.). (*Amer. Jour. Bot.*, 28 (1941), No. 9, pp. 820-832, figs. 17).—This is an anatomical and developmental study of these palms, with brief discussion of the phylogenetic implications. There are 43 references.

Races of *Zea mays*.—I, Their recognition and classification, E. ANDERSON and H. C. CUTLER (*Ann. Missouri Bot. Gard.*, 29 (1942), No. 2, pp. 69-88, pl. 1,

figs. 7).—This is a survey of inter-racial variability in morphology of corn, a discussion of the difficulties in grouping the species into natural races and sub-races, and a classification of the races of the southwestern United States and Central America.

Wood structure of the native Ontario species of *Juniperus*, M. W. BANNAN (*Amer. Jour. Bot.*, 29 (1942), No. 3, pp. 245-252, *figs. 30*).

A petri dish holder for mechanical stages, W. H. WESTON (*Science*, 95 (1942), No. 2468, pp. 415-416, *figs. 2*).—The holder described and illustrated consists essentially of a spring-steel clip firmly clasp ing the dish and carried by a frame fitting snugly into the slide holder of the mechanical stage which controls its movement.

GENETICS

Cold Spring Harbor symposia on quantitative biology.—IX, **Genes and chromosomes—structure and organization** (*Cold Spring Harbor, N. Y.: Biol. Lab.*, 1941, vol. 9, pp. X+315, pls. [16], *figs. [74]*).—Papers were presented at the symposium dealing with the integration of genetics with the borderline fields of physics, chemistry, and mathematics under the general subjects of Structure of Chromosomes as Revealed by Optical Methods; Salivary Gland Chromosomes; Spontaneous and Induced Changes in Chromosome Structure; Mutations; Physical Aspects and Tools; Properties of Giant Molecules as Related to Chromosome Problems; and Conclusion. All of the 34 papers had a bearing on the subject of structure and organization of chromosomes.

The diploid cell and the diploidisation process in plants and animals, with special reference to the higher fungi—criticism and rebuttal (*Bot. Rev.*, 8 (1942), No. 3, pp. 191-193).—A reply by A. H. R. Buller to a criticism by M. Noble (in correspondence) of certain statements in the paper of Buller previously noted (*E. S. R.*, 85, p. 746).

Chromosome numbers in the Hydrophyllaceae, M. S. CAVE and L. CONSTANCE (*Calif. Univ. Pub. Bot.*, 18 (1942), No. 9, pp. [2]+205-216, *figs. 3*).—The authors hope that this survey of chromosome numbers may be useful in determining natural relationships within the family. There are 18 references.

A cytological study of sterility in *Sesamum orientale* L., L. S. S. KUMAR and A. ABRAHAM (*Indian Jour. Genet. & Plant Breed.*, 1 (1941), pp. 41-60, pls. 3, *figs. 34*).—The number and morphology of the somatic chromosomes in the sterile plants were similar to those in their fertile sibs ($2n=26$). Various types of abnormalities during meiosis in pollen mother cells lead to the formation of daughter cells abnormal in their number per mother cell and variable in their chromosome constitution, thus no fertile pollen grains are formed. From comparisons with similar cases where the inheritance of this character has been worked out, it is inferred that the sterility is due to a recessive factor. Failure of gametophyte development is responsible for sterility in the female side. The meiotic peculiarities are described in detail and discussed with reference to their importance in cell behavior.

Application of genetics to animal breeding, J. L. LUSH. (Iowa State Col.). (*Iowa Acad. Sci. Proc.*, 48 (1941), pp. 65-72).—Attention is called to progress in animal breeding through phenotypic selection and a knowledge of the effects of cross-breeding practices and the theoretical results expected from inbreeding, cross-breeding, and selection. Attention is called to the fact that in general the same methods are followed as were employed in the early developments of the breeds, but the newer advances in genetics explain why and how progress was made and suggest the employment of this knowledge for the advancement of breeding practices.

Design of experimental comparisons between lines of breeding in livestock. R. E. COMSTOCK and L. M. WINTERS. (Minn. Expt. Sta. coop. U. S. D. A.). (*Jour. Agr. Res.* [U. S.], 64 (1942), No. 9, pp. 523-532).—Standard statistical methods are analyzed for comparing the means of the progeny of two lines in which there are m sires in each line mated to f dams with k progeny in each line. It is recognized that the variance of the offspring of a dam is included within the variance of groups of offspring of the dams with each sire; also that the variance of the offspring of sires within a line includes both variances. If three variances can be estimated the numbers in each category can be tested as this applies to variance of the means and of the difference between lines required for significance. Some further reflections on the source of variance drawn from a knowledge of the specific fields are given. Tables are presented which demonstrate for specific conditions the effect on efficiency of varying numbers of δ s and ϕ s used to produce experimental animals. The error is lowest when the largest number of sires is used but the cost is greater. At least three or four sires in each line seem preferable. The number of ϕ s will be more effective if the number of sires is increased so that the number of ϕ s bred to each δ remains small.

[Genetic and breeding investigations with livestock by the Illinois Station] (*Illinois Sta. Rpt.* 1938, p. 110-122, 129-130, figs. 5).—Results are briefly reported by G. A. Branaman, B. W. Fairbanks, S. Bull, H. P. Rusk, T. S. Hamilton, E. Roberts, L. E. Card, J. M. Severens, B. R. Burmester, H. M. Scott, J. H. Quisenberry, and L. C. Thomas of progress made in studies of sheep types and breeding for southern Illinois lamb production; efficiency of mutton types and hybrids in meat production; inheritance and progeny testing for pullorum resistance in poultry; effect of diet on chick resistance to pullorum disease; physiology of egg formation in various sections of the oviduct; and completion of studies of hairlessness in rats.

A method of determining the reproductive efficiency of cattle. H. E. KINGMAN and H. E. KINGMAN, JR. (*Amer. Jour. Vet. Res.*, 3 (1942), No. 6, pp. 32-42, pl. 1, figs. 4).—An illustration of the manner in which reproductive efficiency may be calculated for bulls and cows from breeding and calving records and the data necessary for such computation.

A Mendelian situation in the birthcoat of the New Zealand Romney lamb. F. W. DRY and J. A. SUTHERLAND (*Nature* [London], 148 (1941), No. 3758, p. 563).—Supplementing previous results (E. S. R., 84, p. 28), the authors postulate two pairs of linked duplicate factors with two doses necessary to give the N-type halo coat. A suppressing factor may exist which is scarce. In the mating of N or near-N animals, which were considered heterozygous, there were produced 46 N to 14 not-N. In the backcross there were produced 181 N or near-N to 212 not-N.

Breeding and rearing of purebred swine in Puerto Rico. J. BAGUÉ (*Puerto Rico Dept. Agr. and Com., Res. Buls. Agr. and Livestock*, 1941, pp. 127, figs. 13).—Data are presented on breeding operations in 1937-40 with Duroc-Jersey and Hampshire swine herds of the Puerto Rico Reconstruction Administration. During this time there were farrowed 6,139 pigs in 4 herds at different locations. The breeding, farrowing, and mortality records are given by months for each sow as well as the growth of the pigs to 8 weeks of age and the response of sows of the two breeds to tropical conditions.

Genetic linkage in the rabbit. W. E. CASTLE and P. B. SAWIN. (Univ. Calif. et al.). (*Natl. Acad. Sci. Proc.*, 27 (1941), No. 11, pp. 519-523).—The chromosome map for five groups of genes in the rabbit is presented, which includes the mutant gene designated by Greene, Hu, and Brown (E. S. R., 71, p. 458) as dwarf,

which was linked with agouti and wide band. Brachydactyl, described by Greene (E. S. R., 75, p. 610), was linked with furless. From the cross-over percentages obtained these two chromosomes were

	$\frac{A}{0}$	$\frac{dw}{14.7}$	$\frac{w}{30.1}$
and $\frac{f}{0}$			
$\frac{br}{28.3}$			

Hereditary predisposition to sensitization in guinea pigs, J. L. JACOBS, J. J. KELLEY, and S. C. SOMMERS (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 3, pp. 639-641).—By selection in experiments conducted over 3 yr. with four generations, a strain of guinea pigs of which practically all members could be readily and strongly sensitized to allyl isothiocyanate was produced. The sensitization in crosses was shown to be specific and offers a character furnishing an adequate basis for hereditary study.

Developmental abnormalities and spontaneous diseases found in rats of the mutant strain, stub, H. L. RATCLIFFE and H. D. KING (*Anat. Rec.*, 81 (1941), No. 3, pp. 283-305, pls. 2).—Various types of abnormalities, high mortality, reduced growth rate, small body size in adults, and lack of fertility were noted in stub rats. Hyperthyroidism found regularly in ♂s and in about one-half of the ♀s possibly explains the sterility abnormalities. Notation is made of the variation in abnormalities such as shortened tail, reduced number of vertebrae, and abnormalities of the feet.

An analysis of the development of homozygous yellow mouse embryos, G. G. ROBERTSON (*Jour. Expt. Zool.*, 89 (1942), No. 2, pp. 197-231, pls. 2).—It was found that the interference in development of the homozygous lethal yellow mouse was noticeable in the heterozygous parent, and that there was less interference when the ovaries were transplanted into ♀s not carrying the yellow gene. Cytological study of embryos produced by heterozygous yellow parents and allowed to develop 2-6.5 days of age after fertility showed the lethal action to be due to the action of the gene for yellow or a small deletion in the chromosome stopping the enzyme activity at a crucial point in implantation. The onset of the lethal action occurred during the second half of the fifth day, between the time when the blastocyst first comes into contact with the uterine epithelium of a decidual crypt and the time when implantation actually begins. The homozygous yellow embryo disintegrates and is resorbed within 36 hr. Transplantation of the ovaries from the yellow mice to agoutis permitted homozygous yellow embryos to develop in a new uterine environment, and development was more advanced before death than under normal conditions. It thus seemed clear that the lethal effect was concerned with the reaction of the gene to the changed uterine environment. Evidently the A^Y gene has an important influence on the maternal endometrium, which affects the development and expression of the homozygous yellow lethal.

The anaemia of flexed-tail mice (*Mus musculus* L.).—I, Static and dynamic haematology, H. GRÜNEBERG (*Jour. Genet.*, 43 (1942), Nos. 1-2, pp. 45-68, fig. 1).—In anemia of flexed-tailed mice, noted by Hunt (E. S. R., 68, p. 746), the main blood cell size was found to be normal but the hemoglobin was reduced in animals at the younger ages returning to normal in the adult. A study of the blood cytology showed the main cell size to be normal. The hemoglobin concentration was reduced during the first 2 weeks after birth, but the pathologic cells did not persist more than 6 weeks and the red blood picture of flexed mice was normal in the adult animal. Detailed data presented on the serological and corpuscular studies of the blood samples from birth to 2 mo. of age for normal and anemic young from F₁ parents of a cross of normal to flexed-tailed

animals showed that in the normals red cell counts rose steadily from 3,740,000 at birth to over 10,000,000 per cubic millimeter in adults. In anemics the red cell count and hemoglobin content rose from 0.45 to 0.72 of the normal at birth to about normal at 3-4 weeks of age.

Duplication of the seminal vesicles in mice of the C strain, C. W. HOOKER and L. C. STRONG (*Anat. Rec.*, 81 (1941), No. 3, pp. 333-349, figs. 4).—Prickly seminal vesicles and unusually large ribbed coagulating glands were observed in about 70 percent of the ♂s of the inbred C strain. These were not found in other inbred ♂ mice, but were in 61 of 88 F₁ hybrid progeny between them and 307 of 434 F₂ ♂ progeny from the crosses. The duplicating occurred in none of the F₁s and in only 28 of the F₂s. In 131 backcrosses to the C strain there were 128 with prickly seminal vesicles of which 27.5 percent showed the typical duplication. The simplest genetic explanation for duplication based on the F₂ and backcross proportions was that its determination was the result of the simultaneous action of two homozygous genes. Dominance was incomplete. Evidently these genes caused the production of a high level of androgen activity in the C strain. The observed proportions of the progeny closely approximated the expected proportions on this assumption. These conclusions were substantiated by the effects of testosterone propionate injections.

Imperforate in the mouse, its inheritance and relation to endocrine function, J. W. GOWEN and G. HEIDENTHAL (Iowa Expt. Sta.). (*Jour. Expt. Zool.*, 89 (1942), No. 3, pp. 433-450, figs. 6).—The occurrence was noted of ♀ mice in one inbred strain, in which a membrane closed the vagina and unless mechanically ruptured caused enlargement of the uterus and the vagina, and the collection and retention of fluid therein. Of 22 surgically opened ♀ mice bred to normal ♂s, there were produced 7 normal ♀s, but when the heterozygous ♂s among these progeny were bred to imperforate ♀s among the 20 progeny produced, there were 3 imperforates. A two-factor case with the abnormality recessive is suggested, although inheritance of the condition seemed complex.

The "talpid lethal" in the domestic fowl, R. K. COLE (Cornell Univ.). (*Jour. Hered.*, 33 (1942), No. 3, pp. 83-86, figs. 2).—A lethal condition described as "talpid" and causing a variety of anatomical abnormalities in embryos including duplication of digits, shortening of the spinal column and proximal bones of appendages, and severe ectopia was found due to an autosomal recessive. Among 415 fertile eggs produced by heterozygous parents 23.6 percent produced talpid lethal embryos. In further matings it was found that this lethal gene was not in any of the three linkage groups *CpRU*, *DM*, or *FI Cr*.

The endocrine system and hormones, D. G. MCKERCHER (*Canad. Jour. Compar. Med. and Vet. Sci.*, 6 (1942), No. 3, pp. 63-77, figs. 5).—A review is presented of the action of ductless glands and their role in the control of secretions of other endocrines with special reference to the anterior pituitary.

Apparatus for recording cyclical activity in the rat, E. J. FARRIS (*Anat. Rec.*, 81 (1941), No. 3, pp. 357-362, pl. 1).—Description is given of an apparatus for recording photographically cyclical activity in the rat without disturbing the animal.

Exteroceptive factors in sexual periodicity, F. H. A. MARSHALL (*Biol. Rev. Cambridge Phil. Soc.*, 17 (1942), No. 1, pp. 68-90).—The synchronization of sexual cyclic behavior and reproduction seems to be largely controlled by endocrine secretions of the pituitary, which is the regulator of gonadal function. Evidence is summarized of the part played by exteroceptive stimuli, which alters or regulates the gonadotropic activities of the anterior pituitary. Examples are cited from the domestic and laboratory animals and birds under temperate and tropical conditions, with special reference to the effects of light relation between the sexes, nerve stimulation, and the dam-offspring reactions.

Experimental intersexuality: The relative sensitivity of male and female rat embryos to administered oestrogens and androgens, R. R. GREENE, M. W. BURRILL, and A. C. IVY (*Physiol. Zool.*, 15 (1942), No. 1, pp. 1-12).—In a further study of the effect of sex hormones in neutralizing the effects of hormones of the opposite sex in developing rat embryos (E. S. R., 85, p. 749), it was found that similar influences were produced in fetuses of both sexes in response to the same dosage ratio of the two hormones. In conducting the study ♀ rats from the fourteenth to twenty-first day of gestation were injected daily with the combinations in ratios of 1:1 to 1:15 of the two hormones with autopsy on the twenty-second day. An active participation of the embryonic gonads of the fetuses seems indicated by differences in the response of the embryos to hormones of the same sex and the opposite sex. This was termed an homologous stimulation and heterologous inhibition. The effects of different ratios of the hormones on the glands of the two sexes are tabulated and discussed.

Influence of testosterone on the morphogenetic actions of estradiol, S. ALBERT (*Endocrinology*, 30 (1942), No. 3, pp. 454-458, figs. 9).—The administration of testosterone to ♂ rats was found to counteract largely the effects of oestradiol. In these studies the weights of the genital organs and glands were ascertained in four groups of six rats each after 24 days. These groups of rats were treated with oestradiol alone, oestradiol and testosterone, and experimental controls before and after the treatments were provided. It was noted that oestradiol caused enlargement of the pituitary and adrenal glands which were inhibited by testosterone. Although testes growth was inhibited by oestradiol complete spermatogenesis occurred after testosterone was also administered. Certain antagonistic effects of testosterone on oestradiol were noted on the tissue structure of the genital glands.

Post-parturitional heat and the time of ovulation in the albino rat: Data on parturition, R. J. BLANDAU and A. L. SODERWALL (*Anat. Rec.*, 81 (1941), No. 4, pp. 419-431, pl. 1, figs. 3).—Observations of parturition, subsequent oestrous, and ovulation in 61 pregnant ♀ rats by methods previously described (E. S. R., 86, p. 29) showed the duration of parturition to average 8 min. per individual born, although considerable variation existed. The average interval between the end of parturition and the beginning of heat was 18.5 hr. The most frequent time for parturition was between 12 m. and 6 p. m., and for heat from 6 to 12 p. m. The beginning of post-parturitional heat proved to be an excellent indication of the time to expect ovulation.

A method for inducing ovulation in the anoestrous opossum (*Didelphys virginiana*), O. E. NELSEN and E. L. WHITE (*Anat. Rec.*, 81 (1941), No. 4, pp. 529-535).—Experimental studies with 11 ♀ opossums showed that ovulation could be induced by the administration of follicle-stimulating hormone, followed by this hormone with the luteinizing factor. Eggs were recovered from the uterus approximately 24 hr. after the last injection.

The placentation of the Jamaican bat (*Artibeus jamaicensis parvipes*), G. B. WISLOCKI and D. W. FAWCETT (*Anat. Rec.*, 81 (1941), No. 3, pp. 307-317, pls. 2, fig. 1).—Several specimens of the Cuban representative of the Jamaican bat showed the uterus to be of the simplex type. It was almost identical in its mode of placentation with the South American phyllostomid described by Hamlett.¹

The period of gonadal activity in the Maryland muskrat, T. R. FORBES (*Science*, 95 (1942), No. 2467, pp. 382-383).—Histological study of testicular tissue from 222 ♂ and ovarian tissue from 840 ♀ muskrats trapped throughout

¹ Amer. Jour. Anat., 56 (1935), No. 2, pp. 327-353, pls. 2, figs. 17.

several years at the Black Water Migratory Bird Refuge near Cambridge, Md., showed "that in the Maryland muskrat spermatogenesis begins in the middle of December and ovulation in the middle of February, and that seasonal gonadal activity terminates in both sexes during the latter part of October."

Sexual behavior of intersexual domestic fowl, L. V. DOMM and D. E. DAVIS (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 3, pp. 665-667).—Intersexual ♂s developed from the injection of oestrogen into incubating eggs (E. S. R., 82, p. 471) showed gradations in sexual reaction and behavior from essentially normal masculine copulatory patterns to neutral or inactive behavior corresponding to the masculinity of the plumage. The study involved introducing the bird to a rooster, a hen, or a stuffed dummy.

The sexual behavior of hormonally treated domestic fowl, D. E. DAVIS and L. V. DOMM (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 3, pp. 667-669).—Study of the behavior of roosters, capons, and pullets injected with sex hormone material showed that certain behavior patterns are common to both sexes and may be induced by the appropriate hormone, but in genetically determined ♂s both androgen and oestrogen may cause masculine copulatory behavior in capons. Only testosterone induced crowing and increased or induced "tidbitting." The androgen induced crowing and waltzing in bilaterally ovariectomized birds, but oestradiol also caused the feminine squatting behavior.

Survival of spermatozoa in the genital tract of the mare, F. T. DAY (*Jour. Agr. Sci. [England]*, 32 (1942), No. 1, pp. 108-111).—Insemination of 10 Shetland pony and 2 Shire Shetland crossbred mares with semen from 2 stallions and data previously reported (E. S. R., 83, p. 612) showed that pregnancy resulted from inseminations up to 6 days before ovulation but not from earlier inseminations or insemination on the day following ovulation. In 1 mare showing no signs of oestrous but with large follicles ovulation was induced by intravenous injection of 500 mouse units of Physostab (a pregnancy urine extract). The mare was inseminated 2 days before the induced ovulation and became pregnant.

Influence of cell concentration on respiration rate of sperm, C. F. WINCHESTER and F. F. MCKENZIE (Univ. Mo. coop. U. S. D. A.). (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 3, pp. 648-653, figs. 4).—The importance of adjusting semen samples to the same level of sperm concentration if comparable respiration rates are to be determined is pointed out. The oxygen consumption of boar and ram semen determined in previous studies (E. S. R., 85, p. 331) showed that except at lower concentrations a decrease in the oxygen consumption per unit quantity of sperm was invariably accompanied by an increase in the number of sperm per cubic centimeter. The pH did not seem responsible. At concentrations of 0.2-1 billion per cubic centimeter the effect of concentration was not invariably observed. In carrying out the studies semen samples from boars and rams obtained in an artificial vagina were diluted with identical media or centrifuged.

Influence of hydrogen ion concentration on respiration rate of sperm, C. F. WINCHESTER and F. F. MCKENZIE (Univ. Mo. coop. U. S. D. A.). (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 3, pp. 654-656, fig. 1).—Respiration rates of ram and boar semen were definitely influenced by the pH. The optimum for boar semen was 7.2-7.3 and for ram semen 7.0-7.2. Differences in pH were definitely associated with changes in the respiration rate. The study was based on pooled semen samples from four boars of different breeds and nine Rambouillet rams.

A staining method for the differentiation of live and dead spermatozoa.—I, Applicability to the staining of ram spermatozoa, J. F. LANSLEY, G. T. EASLEY, and F. F. MCKENZIE (Mo. Expt. Sta. coop. U. S. D. A.). (*Anat. Rec.*, 82 (1942), No. 2, pp. 167-174, fig. 1).—In a study of the staining properties of a

mixture of sperm from several rams (E. S. R., 87, p. 210) it was evident that live sperm did not stain, whereas dead sperm or sperm that were inactivated stained with a mixture of equal parts of two solutions. One was a 2-percent solution of water soluble eosin and $m/8$ phosphate buffer, and the other was made up of equal parts of opal blue and $m/8$ phosphate buffer. Motility readings and stain were tested after 10 min. storage at 0°, 25°, and 40° C.

The effect of epinephrine upon semen production in the domestic fowl, N. C. WHEELER, G. L. SEARCY, and F. N. ANDREWS. (Ind. Expt. Sta.). (*Endocrinology*, 30 (1942), No. 3, pp. 369-374, figs. 3).—The daily intramuscular injection of eight cockerels with 1.21 and 0.6 cc. of a 1:1,000 solution of epinephrine per kilogram live weight caused decreases in the semen volume and concentration and survival time of sperm with decreased body weight and feed consumption and degeneration of the germinal tissue. The weights and semen production of birds during a 14-day period before and a 49-day period after injection with epinephrine were compared. There was a reduction of approximately 40-50 percent in these characteristics as a result of the treatment.

Duality of pituitary gonadotrophins: Effects of FSH-IUSH mixture on hypophysectomized male and female rats, H. FRAENKEL-CONRAT, C. H. LI, M. E. SIMPSON, and H. M. EVANS. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 3, pp. 723-726).—Injection of immature hypophysectomized ♂ and ♀ rats with follicle-stimulating and interstitial cell-stimulating hormones, alone or in combination, showed that enlargements were induced in ♂s in the testes and ventral prostate and in ♀s in the size of the ovaries and uteri. It was further made evident as a result of single injections that the effects were follicle-stimulating in ♀s and interstitial cell-stimulating in ♂s. Responses corresponding to the effects of the single hormones were produced in each sex. In conclusion it seems evident that the results cannot be explained on the basis of a single pituitary gonadotropic hormone.

Changes in hormone content of the female rabbit hypophysis after mating, J. A. SAXTON, JR., and H. S. N. GREENE (*Endocrinology*, 30 (1942), No. 3, pp. 395-398).—Assays of the gonadotropic properties of pituitaries from seven ♀ rabbits 4-48 hr. after mating showed less stimulation of the follicles, luteinization, and growth in the thyroid and adrenals of immature ♀ guinea pigs than glands from normal unmated rabbits. These results indicate that the hormones are released from the pituitary during the mating process.

Effect of progesterone on the ovaries and embryos of mice in early pregnancy, H. O. BURDICK (*Endocrinology*, 30 (1942), No. 4, pp. 619-622).—The daily injection of 1 mg. of progesterone, begun on the day of mating, prevented implantation. When the injections were delayed until the second day after mating the corpus luteum showed signs of regression, but the embryos grew until injection ceased, when they died.

Toxicity of saline uterine extracts from rabbits during pregnancy, pseudopregnancy, and after corpus luteum hormone administration, B. KRICHESKY and J. MAHLER. (Univ. Calif.). (*Endocrinology*, 30 (1942), No. 4, pp. 616-618).—Rabbits killed at various stages of gestation or pseudopregnancy were found on extraction with saline solutions and injection into rabbits to have toxic properties from the second to the twenty-ninth day of pregnancy or from 24 hr. to 17 days pseudopregnancy. Functional corpora lutea were associated with the toxic condition since the toxic substance was also present in the uteri of ovariectomized ♀s treated with corpus luteum hormone. A total of 108 rabbits were employed in the study.

Growth and regression of corpora lutea during the normal estrous cycle of the rat, J. L. BOLING (*Anat. Rec.*, 82 (1942), No. 2, pp. 131-145, pls. 2, fig. 1).—

The growth and regression in volume of the corpus luteum were ascertained in 15 albino rats autopsied at 0.5–4.0 days after the beginning of heat. The volume of the corpus luteum increased rapidly 12–48 hr. after the beginning of heat, with regression starting at 72 hr. and continuing more rapidly with the establishment of corpora lutea of the next oestrous cycle.

Some effects of progesterone on male and female mice, W. F. STARKEY and J. H. LEATHEM (*Amer. Jour. Physiol.*, 135 (1942), No. 3, pp. 567–571).—The subcutaneous administration of 10 doses of 0.25 mg. of progesterone for 10 or 20 days to immature ♀ mice caused a suppression of corpora lutea formation without impairment of follicular growth. In ♂s there was retardation of increased weight normally expected in the seminal vesicles without any influence on spermatogenesis. The studies were conducted with 3 groups each of 3–17 immature ♀ and 2–14 immature ♂ mice and 4 groups of 4–12 mature mice. Histological study was made of the gonads after treatment ceased.

The potency of stilbestrol in the immature female rat, H. M. LEE, E. B. ROBBINS, and K. K. CHEN (*Endocrinology*, 30 (1942), No. 3, pp. 469–473, fig. 1).—Stilboestrol was shown to be 12 times as active as oestrone by oral administration and 32 times as active when subcutaneously administered to ♀ rats 21–23 days of age. Vaginal opening and uterine weights served as the measurement of the effects of the different doses.

Biological assays of the male chicken pituitary for gonadotropic potency, G. M. RILEY and R. M. FRAPS. (U. S. D. A.). (*Endocrinology*, 30 (1942), No. 4, pp. 529–536, figs. 6).—The number of mouse uterine units (E. S. R., 78, p. 473) of gonadotropic hormone per pituitary of ♂ birds having testes 10–25 gm. in weight (7–8 mo. old) was calculated as 6.5 for crossbreds with Black Sumatra as one parent, 5.0 for White Leghorns, 4.5 for Rhode Island Reds and Columbian, and 3.0 for White Wyandottes. Stage two of the vaginal reaction in 50 percent of the injected mice was similar in order to the findings with the uterine test. Increases in size of the genital organs of immature ♀ rats and pigmentation in the African weaver finch showed the ♂ pituitary to be a relatively good source of the follicle-stimulating and luteinizing hormones.

Relationship of gonad-stimulating activity of female domestic fowl anterior pituitaries to reproductive condition, G. M. RILEY and R. M. FRAPS. (U. S. D. A.). (*Endocrinology*, 30 (1942), No. 4, pp. 537–541).—In general, anterior pituitary powder from hens with follicles in the regressive or quiescent phase shows a higher gonad-stimulating effect on immature mice than such powder from hens in full reproductive condition. This study was based on pituitary powder from groups of 119 White Leghorn and Rhode Island Red hens in different stages of reproduction determined by the size and condition of the ovaries of the fowls and the effects on ovarian and uterine weights of mice. Compared with the previous paper, pituitaries from sexually mature ♂s have a gonadotropic potency of approximately 11 times that of the glands from laying hens and 7 times that of pituitaries from hens with quiescent follicles.

Action of prolactin and estrone on weights of reproductive organs and viscera of the cockerel, W. R. BRENNEMAN (*Endocrinology* 30 (1942), No. 4, pp. 609–615).—Comb and gonad growth were inhibited in normal- and limited-diet chicks by daily injections from the third to the nineteenth day with oestrone or prolactin. Whole pituitary extract stimulated comb and gonad growth in limited-diet chicks. The hormone treatment also influenced the cell content of the pituitary glands.

An experiment to determine the effect of the growth hormone of the anterior lobe of the pituitary gland on swine, D. D. GILES. (Tex. A. and M. Col.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 6, pp. 77–85).—Barrows and gilts

responded similarly to intraperitoneal injection of 3 and 6 cc. of phyone, a commercial preparation of growth hormone of the pituitary, per 100 lb. of live weight. Doses of 6 cc. did not produce noticeable increases in growth or in efficiency of feed utilization, affect the length of the intestine, or influence the weight of visceral organs. However, increased calcification was noted.

The bone histology of adult male rats thyro-parathyroidectomized when one month of age, H. BECKS, E. A. KIBRICK, and H. M. EVANS. (Univ. Calif.). (*Jour. Expt. Zool.*, 89 (1942), No. 2, pp. 297-303, pl. 1).—Thyroparathyroidectomy of six ♂ rats at 27-28 days of age materially reduced the oxygen consumption and the weight at autopsy at approximately 500 days of age. Differences in the thickness and complexity of the bony trabeculae involving a general retardation in size and weight were also noted.

Lack of effect of thyroxin on blood sugar and glycogen stores of fasted hypophysectomized rats, V. V. HERRING, H. FRAENKEL-CONRAT, and H. M. EVANS. (Univ. Calif.). (*Endocrinology*, 30 (1942), No. 3, pp. 483-484).—Daily injection for 10 days of hypophysectomized rats with 0.015 mg. of thyroxin had no effect in preventing the fall in blood sugar and exhaustion of the liver and muscle glycogen stores. It is therefore concluded that this dose of thyroxin either does not stimulate gluconeogenesis in hypophysectomized rats, or it must be offset by greater carbohydrate utilization.

Effect of thyroxin on the insulin content of the rat's pancreas, H. FRAENKEL-CONRAT, V. V. HERRING, M. E. SIMPSON, and H. M. EVANS. (Univ. Calif.). (*Endocrinology*, 30 (1942), No. 3, pp. 485-486).—In several experiments daily doses of thyroxin at levels of 0.0075-0.015 mg. per 100 gm. for 10-20 days were shown to decrease the pancreatic insulin content of hypophysectomized rats, but the insulin increased in normal rats.

Further investigations in the proliferative activity of the thyroid gland of the female guinea pig during the sexual cycle, K. S. CHOUKE and H. T. BLUMENTHAL (*Endocrinology*, 30 (1942), No. 3, pp. 511-515, fig. 1).—The total number of mitoses in the thyroid glands of ♀ guinea pigs was shown to reach a peak on the fourth to sixth day of the oestrous cycle in two series of experiments. The left lobe of the thyroid generally showed more activity than the right.

Some effects of thyrotropic hormone on the pregnant rat, C. E. TOBIN (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 3, pp. 592-595).—In a study of the effect of injections of thyrotropic hormone on the developing embryos of 10-day pregnant rats, it was found that a high percentage of dead embryos occurred which was inversely proportional to the duration of the treatment rather than the size of the dose. A single dose of 0.5 cc. hormone was much less harmful to the young than five daily treatments with 0.1 cc. There was noted to be stimulation of the maternal thyroid and luteinization of the unruptured follicles, which were thought to cause the excessive embryonic deaths in 24 experimental and control animals.

FIELD CROPS

[Field crops work in Illinois]. (Partly coop. U. S. D. A., Ill. Nat. Hist. Survey, et al.). (*Illinois Sta. Rpt.* 1938, pp. 31-62, 63-70, 73-78, figs. 6).—Crops investigations reported on briefly (E. S. R., 82, p. 614) by W. L. Burlison, R. F. Fuelleman, J. C. Hackleman, C. M. Woodworth, O. H. Sears, M. D. Appleman, J. J. Pieper, W. P. Flint, J. H. Bigger, B. Koehler, O. Bolin, G. H. Dungan, W. J. Mumm, A. L. Lang, R. O. Snelling, D. C. Wimer, E. E. DeTurk, F. C. Bauer, I. R. Hoener, O. T. Bonnett, H. H. McKinney, E. E. Cockrum, E. W.

Lehmann, M. J. Dorsey, C. J. Badger, P. E. Johnson, H. P. Rusk, C. A. Van Doren, and L. E. Gard, included variety trials with corn (and corn hybrids), winter and spring wheat, oats, barley, perilla, red clover (strains), soybeans, and miscellaneous grasses and clovers and combinations of pasture and forage plants; breeding work with corn for oil and protein content and with wheat, oats, and soybeans; improvement of corn by inbreeding and by reconstitution; influence of soil N on protein contents of high- and low-protein corn strains; effects of treatment of hybrid corn having injured seed coats, of treatment several months before planting, of storage after treatment, and of different drying rates on subsequent infection; effect of mass handling on seed corn vitality; effects of hailstorms on yields of soybeans and of storage on vitality; barley seed weight as affected by degrees of flower mutilation; cultural (including planting) tests with soybeans, red clover, and perilla; cutting tests with red clover; fertility value of cornstalk ash and residues; pasture studies, including fertilizer treatments and acre yields and consumption of grasses and their composition and adaptations; studies of factors influencing the nodulation of soybeans; comparison of types of legume inoculants; importance of chemical content of farm crops; and studies of development and chemical control of bindweed.

[Field crops work in Pennsylvania] (*Pennsylvania Sta. Bul. 414 (1941), pp. 13-16, 18, 37-39, figs. 2*).—Progress is reported by C. J. Irvin, C. F. Noll, H. B. Musser, C. O. Cromer, D. E. Haley, O. E. Street, and J. W. White from breeding work with corn (and hybrids), wheat, oats, and creeping bent; variety tests with corn (and hybrids), wheat, oats, barley, soybeans, red clover strains, and grasses for fine turf; moisture as a factor in combining wheat and oats; tobacco rotations, and fertilizer experiments, especially in regard to potassium; response of fine turf grasses to fertilizers; and resistance of bentgrass to diseases.

[Farm crops research in South Dakota.] (Partly coop. U. S. D. A.) (*South Dakota Sta. Rpt. 1941, pp. 4-6, 7-12, 55-58, fig. 1*).—Progress results are again reported by L. F. Puhr, C. J. Franzke, A. N. Hume, W. F. Buchholtz, E. L. Erickson, S. P. Swenson, J. E. Graflus, and R. P. Ahlquist from experimentation with field crops (*E. S. R., 84, p. 752*), including breeding work with corn and hybrids, hard red spring and winter wheat, oats, barley, rye, grasses, and sorghum for low HCN content; development of high- and low-protein strains of corn; cultural (including planting) tests with grasses, soybeans, and corn; cultural and assay tests with *Ephedra sinica*; corn and sorghum in alternate rows; variety tests with wheat, barley, oats, corn, soybeans, and forage grasses; and control of bindweed with cultural practices and chemicals.

[Field crops experiments in Wisconsin, 1940-41] (*Wisconsin Sta. Bul. 455 (1942), pp. 19-21, 22-29, 31-34, 35-38, 47-48, 52, 79-81, figs. 9*).—Experimentation with field crops and related agronomic studies (*E. S. R., 85, p. 471*), reported on briefly from the station and substations, were concerned with advantages of clipping or pasturing part of the alfalfa crop when from 3 to 6 in. high, by L. F. Graber and D. Smith; hay yields from grasses, legumes, and their mixtures, by H. Ahlgren; merits of alfalfa-bromegrass pasture, by Ahlgren and I. W. Rupel; renovation of steep pastures by liming, seedbed preparation, fertilization, seeding, and controlled grazing, by Ahlgren, R. Muckenhiirn, M. L. Wall, R. A. Farrington, and H. C. Moser; crossing of bitter and nonbitter sweetclover, by W. K. Smith (coop. U. S. D. A.); replacing redtop with Kentucky bluegrass as the dominant growth on Colby silt loam pastures, by Ahlgren, A. R. Albert, and L. Nelson; fertilizer needs of reed canary grass, by Albert; the comparative merits of Vicland and other oats, by

H. L. Shands and B. D. Leith; variety and seeding tests of winter and spring wheat at Ashland, by E. J. Delwiche and D. H. Holt; comparisons of varieties of rye and winter and spring wheat at Sturgeon Bay, by Delwiche, E. Hirsch, and L. Muskavitch; control of weeds in grain by chemical sprays, by A. Schwendiman and J. Torrie; poison-ivy control with ammonium sulfamate spray, by J. Callenbach and J. Carpenter; methods of distinguishing seeds of rutabaga and wild turnip and of identifying quackgrass seed, both by Schwendiman; cooking quality tests with potato varieties, by G. Rleman, W. E. Tottingham, J. S. McFarlane, C. O. Clagett, and R. MacVicar; trials of certified seed of potato varieties, by H. M. Darling, V. H. Quick, H. R. Noble, and H. N. Haferbecker; fertilizer and manuring experiments with tobacco, with special effort to avoid injury to burning quality from excessive chlorine, and growing of certified tobacco seed of six varieties, both by J. Johnson; and studies of factors influencing the root development of crop plants, by R. H. Roberts and B. E. Struckmeyer.

A comparison of methods of quadratting short-grass vegetation, L. ELLISON. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 10, pp. 595-614, figs. 4).—The pantograph-chart, density-list, and point-analysis methods of quadratting *Bouteloua gracilis* and *Buchloe dactyloides* vegetation were tested on three typical short-grass quadrats of low, intermediate, and high density. The methods, on an average, reflected similarly the marked differences between quadrats, although with differing absolute values. Grass areas by the chart method tended to be 50 percent greater than by the other methods which gave similar areas. The chart method was generally the least consistent and most time-consuming, and its net efficiency varied from 50 to less than 2 percent of that of the other methods. The list method tended to give the most consistent results and in net efficiency greatly surpassed the other methods, except that the net efficiency of the point method was the higher on the high-density quadrat. Consistent differences between five trained observers were most evident on the quadrat with grass of highest density and most matted habit. Interactions were demonstrated between observers and methods. Inconsistencies, sometimes of considerable magnitude, appeared within the work of a given observer. It is suggested that for estimating area of short-grass vegetation on permanent quadrats, the density-list method, carefully standardized, be applied. The point-analysis method may be used for training and standardizing observers in the list method. The chart method should be reserved for studies in which the major need is a detailed graphic record of the vegetation.

Growth and carbohydrate content of important mountain forage plants in central Utah as affected by clipping and grazing, E. C. MCCARTY and R. PRICE (*U. S. Dept. Agr., Tech. Bul. 818* (1942), pp. 51, figs. 21).—Both season and year-long growth and carbohydrate-nutritional data are presented for mountain brome (*Bromus carinatus*) and slender wheatgrass (*Agropyron trachycaulum*), perennial forage grasses, and sticky geranium (*Geranium viscosissimum*) and niggerhead (*Rudbeckia occidentalis*), broadleaf herbaceous perennial forage plants native to the Wasatch Mountains in central Utah, as well as data on trends of storage of carbohydrates in these plants under several controlled clipping treatments and as a result of livestock grazing, 1932-35.

Storage of carbohydrates in perennial range plants, like annual growth, is cyclic and related to the cycle of annual growth; and is at a minimum during the periods of greatest growth and at maximum during August and September, with the completion of secondary herbage growth. Early growth in the spring depends upon reserve foods in the plants, and subsequent growth depends upon the currently assimilated foods. Sucrose and starch are the

principal carbohydrates stored. Among clipped plants, the highest percentages of yield and greatest carbohydrate storage occurred in plants clipped early, i. e., when 4 and 6 in. high, and at the close of the growing season, when foliage was dry. The quantity of carbohydrates stored in the roots and stem bases of plants was related to the amount of foliage present during the normal storage period—August and September—and was less as the interval decreased between clipping and the normal storage period. Results obtained from cattle grazing closely resembled those from comparable clipping treatments. The seasonal trend of carbohydrate reserves under repeated grazing was markedly below that of the ungrazed plants.

The key to practical grazing use of forage plants on western mountain ranges appeared to be moderate use, grazing the grasses to an average height of from 3 to 4 in. at about monthly intervals or less frequently, and allowing, at least periodically, for slackening in intensity of grazing during the intense reproductive period and the fore part of the fall storage period. See also an earlier note (E. S. R., 82, p. 176).

The relations of vegetative composition and cattle grazing on Nebraska range land, T. E. BRINEGAR and F. D. KEIM (*Nebraska Sta. Res. Bul. 123 (1942), pp. 39, figs. 23*).—The vegetation of tall and short grass range land was analyzed, activities of cattle on the range were observed, and effects of grazing upon the vegetation were determined, 1937–40, in Cherry County, Nebr.

Vegetative types in the sand hills in order of decreasing forage production per acre were wet meadow, dry meadow, saltgrass, dry valley, and dune sand. The hard-land region dominated currently by short grasses was an area with very uniform vegetation and no distinct vegetative types. One reason for this uniformity was wide occurrence of blue grama.

Temperature, wind, cloudiness, or other climatic factors seemed to have little effect upon activities of cattle. The rate of stocking or type of forage produced did not have much effect upon total hours spent in grazing and resting. Cattle grazing on the hard lands, irrespective of stocking rate, grazed and rested for shorter periods than did herds in the sand hills, possibly due to the difference in the type of forage upon which the cattle graze.

Analyses of grazing zones of each pasture showed much disturbance by trampling and overgrazing nearest the watering place. The zone nearest water might be likened to overgrazed pasture, the zone at an intermediate distance to a moderately grazed area, and that near the pasture boundary to a lightly grazed pasture. After several years of such overgrazing near windmills the vegetative composition became drastically changed, resulting in invasion of unpalatable weeds in abused areas. Great change in vegetative composition appeared usually to be the result of several years of abuse, while the difference in the percentage of utilization in the various zones may be an index to current use. The most serious factor in deterioration of sand hill ranges probably is improper distribution of grazing animals, resulting in extreme overgrazing on parts of the range and undergrazing on other areas. This, however is also a serious problem in hard-land pastures.

How to graze blue grama on southwestern ranges, E. C. CRAFTS and G. E. GLENDENING (*U. S. Dept. Agr. Leaflet 215 (1942), pp. 8, figs. 4*).—The characteristics of blue grama and its adaptations, values as range forage and as a soil binder, and its utilization are described briefly. Under current management practices blue grama is grazed during summer only, winter only, or throughout the year. The grass does best, however, when rested or grazed only lightly during its growing season and then utilized to the proper point during the late fall, winter, or early spring. Maximum growth is obtained under summer de-

ferred grazing, and opportunity is given for seed to mature and disseminate. Besides proper seasonal use, livestock distribution over the range should be controlled through herding, riding, and proper location of salt and water.

Reseeding practices for New Mexico ranges, J. O. BRIDGES (*New Mexico Sta. Bul.* 291 (1942), pp. 48, figs. 11).—Methods of reseeding range (E. S. R., 85, p. 613) are outlined for the various types of range sites located in the southwestern and northwestern semidesert areas, west-central plateau, high mountains, northern foothills, and eastern plains of New Mexico. Directions are given on seedbed preparation; depth, rate, and time of seeding; species and mixtures for the several areas; seed source; transplanting; management of young stands; mulching; and use of mature hay. Information on costs of operations is appended, together with a table showing characteristics and adaptations of species suitable for artificial reseeding of range in the State.

Pasture and forage crops for irrigated areas in Colorado, D. W. ROBERTSON, R. M. WEIHING, and T. G. STEWART (*Colorado Sta. Bul.* 469 (1942), pp. [47], figs. 10).—Available information presented on the production of crops usable for pasture and harvested forage in irrigated areas of the State, based extensively on station research, deals with grasses, legumes, and mixtures, and establishment (E. S. R., 66, p. 131) and management of permanent pastures; crops and practices for temporary pastures; and legumes, cereals, grasses, and mixtures for use as hay, fodder, and silage crops. Mixtures recommended for well-irrigated pasture include per acre brome grass 8 lb., orchard grass 8, meadow fescue 6, timothy 4, and a legume consisting of yellow sweetclover 4 lb. or 2 lb. each of yellow sweetclover and alfalfa or red clover. In the warmer sections of the State perennial ryegrass may replace timothy. If bloat is not a serious problem alfalfa can replace sweetclover in the mixture. Where the soil is poorly drained and subject to seep, the mixture may contain redtop 10 lb., timothy 6, reed canary grass 4, alsike clover 2, and strawberry clover 2 lb. In areas which are wet and saline enough to produce saltgrass and sedges, strawberry clover seeded at from 1 to 2 lb. per acre and disked into the soil will increase the carrying capacity.

Grass farming for improving depleted soils, S. J. LOWRY and L. M. CALDWELL (*Kentucky Sta. Cir.* 52 (1942), pp. 19, figs. 9).—Methods used and results obtained at the Western Kentucky Substation in restoring worn-out eroded, although originally productive, fields are described. Acreages too uneven, steep, or eroded for experimental plots were improved for profitable production of field crops and pasture by successive grubbing of bushes, filling of gullies, and terracing, followed by basic treatments of ground limestone and superphosphate. Most of the fields were planted to corn, followed by wheat or rye for cover and grain, and then sown to a clover-and-grass mixture which remained for 3 yr. or longer. By the time the land remained in pasture for 3 yr. or longer the fertility was improved enough to assure reasonably good crops. The treatment, however, was repeated in the second round of the rotation, and bluegrass was included in the seed mixture of all the longer rotations. The second round of rotation has been completed on all these fields, and they produce good yields of corn, wheat, and hay or bluegrass pasture. Management practices followed on the several fields have varied, depending on topography, condition of the sod, and the need for tillable land or hay acreage. The four distinct methods used on the fields were 3-yr. crop rotation, longer rotations, alfalfa rotations, and permanent pastures.

Experiments with field beans, E. V. HARDENBURG ([*New York*] *Cornell Sta. Bul.* 776 (1942), pp. 28, figs. 8).—Results of experiments with field beans, 1925-40,

on longevity, size, and sources of seed, place-effect, inoculation, fertilization, spacing, cultivation, and varieties are summarized.

Seed beans stored at room temperature and relatively low humidity cannot be expected to maintain a viability of over 90 percent longer than 4 yr. If seed stored longer than 1 yr. tests less than 90-percent viable, there should be a corresponding increase in acre rate. When Robust Pea and Red Kidney beans were grown in other States under differing environmental conditions and part of the crop returned for measurements, place-effect proved of no significance as to yield and was not marked on seed shape, although beans grown under drier conditions were more elongated and flatter than under humid conditions. No significant differences in total yield or several other agronomic characters resulted from use of large, ungraded, and small seed of either Robust Pea or Red Kidney. Yield and root nodulation did not show that growers should practice seed inoculation.

With beans after sod, receiving manure and different amounts of superphosphate, all treatments increased yield, and the greatest gains resulted from manure with superphosphate. The highest net gain from a single treatment was from 300 lb. of superphosphate. The cost of manure was not justified. Other fertilizer experiments, 1935-36, with both varieties grown after potatoes well fertilized demonstrated that at least 10-20 lb. of N per acre would be profitable where beans are not planted on manured sod. From 200 to 300 lb. per acre of such mixtures as 6-18-6 and 4-12-4 are suggested where beans follow another cultivated crop. In a comparison of the grain drill and bean planter for seeding and fertilizing beans, yields favored the planter by 8.7 bu. per acre, or 57.6 percent, the difference being ascribed to shallower seeding, more compact surface soil, and closer placement of fertilizer.

Spacing tests over 7 yr. suggested a spacing of six plants per foot for Red Kidney and French White Kidney and drilling rather than hill planting, for Robust Pea four plants per foot, and Perry Marrow six plants per foot in hills 12 in. apart. As seeding rates decreased, the number of pods per plant increased. Close spacing of plants was not followed by an increase in percentage of green or immature pods. Three or four cultivations resulted in yields as large as those after six cultivations, and yields after scraping to remove weeds without stirring the soil were as high as from cultivated plants.

Although Robust Pea generally outyielded all other varieties, Michelite yielded nearly as well as Robust and was more popular among dealers because of its whiter, less-veined, smoother, more uniform seed. White medium beans, as Blue Pod and Otenashi, has not yielded as well as pea beans, carried more mosaic, and were declining in production. Yelloweye and White Marrow compared favorably with Red Kidney in yield but were more subject to weathering in regions of high rainfall and heavy soil. Red Kidney averaged below pea beans in yield, but because of higher market price and resistance to weathering, it is recommended for conditions at Ithaca. The merits of other varieties are described briefly.

Corn hybrids for New Jersey, C. S. GARRISON (*New Jersey Stat. Agr.* 429 (1942), pp. 4, pl. 1).—In recent tests New Jersey corn hybrids Nos. 2 and 4, developed in the station's breeding program, surpassed open-pollinated varieties and hybrids from Midwestern States in yields of grain and silage. Other good characteristics of these hybrids are described.

Hybrid corn in Wyoming, 1941, W. A. RIEDL and W. L. QUAYLE (*Wyoming Sta. Bul.* 251 (1942), pp. 23, fig. 1).—Under irrigation, at altitudes of from 4,000 to 5,000 ft., adapted corn hybrids (E. S. R., 85, p. 340) gave much larger yields of both grain and forage over the period 1939-41 than the best open-pollinated

varieties. The advantage in favor of the best hybrids averaged 25 bu. of grain and 1.4 tons of dry forage, or 32 and 23 percent, respectively. Under irrigation at an altitude of 7,200 ft. a few hybrids matured earlier than the best adapted varieties and several produced more forage, but none of the hybrids or varieties mature in the shortest seasons. Under dry-farm conditions at altitudes of from 3,700 to 4,500 ft. during favorable years a few hybrids made significantly higher grain yields than the best adapted open-pollinated variety. For 2 yr., one unfavorable and one favorable, Falconer gave a higher average grain yield than any hybrid. Most hybrids tested yielded more forage than the best local varieties compared.

Irrigation requirements of cotton on clay loam soils in the Salt River Valley, K. HARRIS and R. S. HAWKINS. (Coop. U. S. D. A.). (*Arizona Sta. Bul. 181* (1942), pp. [3]+421-459, figs. 4).—Cotton of the Pima (American-Egyptian) and Acala varieties was grown, 1935-40, under several irrigation schedules on clay loam soils of the Laveen series on the Mesa experiment farm. See also an earlier note (E. S. R., 60, p. 42).

Plants receiving an early irrigation after planting were stimulated into rapid and extensive growth before heavy flowering and consistently outyielded those not irrigated after planting until they reached the wilting point. Subsequent irrigations were given at the same soil moisture levels. In general, the higher final yields followed the more rapid growth before heavy fruiting. Early irrigation encouraged early fruiting, as was shown by the greater percentage of the total crop harvested at the first picking. Similarity in root development was indicated by water absorption from depths of from 2 to 6 ft. in August-October. Excessive vegetative growth during fruiting, even though the plants had been stimulated into rapid growth before fruiting, could be prevented largely by regulation of irrigation. Plants growing fastest from planting to July 31 and continuing growth at a moderate to low rate from July 31 to September 10 yielded highest. Cotton plants evidently should be allowed to reduce available soil moisture more completely between irrigations during fruiting than prior to this period, unless stressed too severely before fruiting. Detrimental effects of puddling of the soil during seedbed preparation might persist throughout the entire season. Cotton provided with limited soil moisture during fruiting had a higher ginning percentage than that given abundant soil moisture during this period.

Pure-seed production of Egyptian-type cotton, R. H. PEEBLES (*U. S. Dept. Agr. Cir. 646* (1942), pp. 20, figs. 11).—Methods used to produce pure planting seed in Arizona are described, with comments on stability of Egyptian-type varieties, ill effects of hybridization, and gin-run seed. Cardinal points in the procedure for maintaining pure seed since the advent of upland cotton culture in Arizona are isolation of plantings to prevent excessive cross-pollination with other varieties, particularly those of upland cotton; planting on clean land; roguing of the seed-increase fields to eliminate upland plants, hybrids, and other harmful rogues; and prevention of accidental seed mixture.

Oat variety tests in Montana, A. M. SCHLEHUBER, J. J. STURM, and R. H. BAMBERG. (Coop. U. S. D. A.). (*Montana Sta. Bul. 399* (1942), pp. 20, fig. 1).—On irrigated land at Bozeman (1930-40) the midseason oats varieties, as Victory and Bridger, outyielded the early varieties, while on dry land at Havre and Moccasin (1930-40) and Huntley (1928-33) the earlier varieties, as Gopher, Markton, and Markton × Victory, were superior. Victory had the highest test weight per bushel of varieties at Bozeman. At Havre two Markton × Victory selections were heavier than Gopher, which averaged heavier than Markton, Colorado 87, Swedish Select, and Banner. At Moccasin there were only slight

differences between varieties. The average percentage of protein of nine varieties tested at Bozeman ranged from 14.65 for Gopher to 11.40 for Markton × Victory, whereas differences in percentage of hulls were not significant. Lodging was important only under irrigation at Bozeman. Gopher (0.72), Markton × Victory (C. I. 3976) (9.0), and Bridger (9.6 percent) lodged appreciably less than Victory (20.5 percent). Bridger and Victory are recommended for irrigated land and Gopher for dry or nonirrigated land.

Peanut production for oil in the national defense program, E. R. COLLINS. (N. C. Expt. Sta.). (*Amer. Fert.*, 96 (1942), No. 10, pp. 6-7).—Practical recommendations are made on selection of soils and varieties, cultural methods, fertilizer and liming practices for the older and newer peanut areas, and rotations.

Experiments with early potatoes on sandy loam in southern Ohio, J. BUSHNELL (*Ohio Sta. Bimo. Bul.* 215 (1942), pp. 63-70, fig. 1).—Variety, seed, cultural, fertilizer, and rotation and cover crop experiments, 1929-41, at the Washington County Truck Farm near Marietta are summarized, with comments on potato diseases and insects. Chenango sandy loam proved to be excellent for early potatoes, the 13-yr. average yield of marketable tubers being 256 bu. per acre. Warba, 343 bu. No. 1 per acre, averaged higher in yield than Irish Cobbler, 304 bu., and both outyielded other early varieties. Yields from certified Cobblers grown in various seed-producing districts did not differ much. Cobblers grown at Wooster from early-May or early-June plantings were suitable for seed, producing about the same as northern certified seed. While a 6-8-8 fertilizer at 1,000 lb. per acre was ample for yields of 300 bu. per acre, a somewhat heavier rate is suggested if a higher yield is anticipated. Early potatoes were grown for 8 successive years on the same land without difficulties. Winter barley sown in August proved very satisfactory as a cover crop.

Adventitious roots on panicles of rice, J. W. JONES and M. N. POPE. (U. S. D. A.). (*Jour. Hered.*, 33 (1942), No. 2, pp. 55-58, figs. 2).—The occurrence of adventitious roots on panicles of Nira and Caloro rice is described and illustrated, with remarks on behavior in inheritance.

Influence of variety, environment, and fertility level on the chemical composition of soybean seed, J. L. CARTER and T. H. HOPPER (*U. S. Dept. Agr. Tech. Bul.* 787 (1942), pp. 66, figs. 10).—In the 10 representative varieties studied the percentages of carbohydrate, nitrogenous, lipide, and mineral constituents in the soybean appeared to be influenced by the physiological vigor as controlled by the environment during the entire growth period of the plant. The iodine number of the oil from the seed of a variety appeared to be critically influenced by the prevailing temperatures during the period of bean development and oil metabolism. High temperatures depressed and low temperatures raised the iodine number. In general, the oil content of the soybean seed is most specifically a varietal characteristic, and the iodine number of the oil is about equally influenced by variety and climate under the observed conditions. As a rule, no large variations in the percentages of crude fiber in the seed and unsaponifiable matter in the oil were observed. Some variation in these constituents due to variation in seed size and ratio of seed coat to cotyledon was noted, however. High calcium content always resulted when the soybeans were grown at high temperatures. Total ash, phosphorus, and potassium content of the seed appeared to be influenced more by soil type and fertility than by variety or variations in climate. Fertility level affected yield but was without noticeable effect on composition of soybean seed with respect to oil and protein content and iodine number of the oil. Within the limits ordi-

narly encountered in breeding and variety testing, soil fertility did not appear to affect the relative rank or order of varieties and strains of soybeans with respect to these components. Varieties were found to differ significantly in composition. Pedological and climatic factors did not greatly influence the relative standing or ranking of the several varieties with reference to the percentages of oil, protein, phosphorus, and calcium. The importance of this work is in the finding that varieties and strains of soybeans seem to inherit their characteristic chemical composition, making possible progress in breeding for desired chemical composition as well as for yield and other agronomic factors. See also an earlier note (E. S. R., 86, p. 322).

Varieties of spring wheat for the North Central States, J. A. CLARK. (Coop. State expt. stas. et al.). (*U. S. Dept. Agr., Farmers' Bul. 1902 (1942), pp. 11+20, figs. 19*).—Varieties of hard red spring wheat, durum and red durum, and white spring wheat grown in the Northern Plains and Prairie States are described, with remarks on adaptations and market classes of spring wheats. The information given supersedes that in Farmers' Bulletins 1621 (E. S. R., 63, p. 635) and 1706 (E. S. R., 70, p. 614).

Oklahoma farm wheat improvement program: Summary report, 1937–1941, inclusive, H. S. SMITH (*Oklahoma Sta. Misc. Pub. 6 (1942), pp. [1]+24, figs. 2*).—Farmers' wheat samples (E. S. R., 85, p. 47) tested, 1939–41, averaged 8.5, 14.1, and 77.4 percent of A, B, and C grades, respectively, based upon the Canadian crop-testing method. Average milling and baking results of 54 samples of 4 important wheat varieties agreed with other reports. Chiefkan ranked below Tenmarq, Turkey, and Blackhull, being particularly undesirable in dough properties, loaf volume, and color. Of 7 hard winter wheat varieties grown at a number of locations, 1939–41, Chiefkan averaged 19.3 bu. per acre, Tenmarq 19.2, Early Blackhull 18.2, Cheyenne 17.5, Blackhull 16.9, Kanred 16.8, and Turkey 15.9 bu. Chiefkan and Early Blackhull grown in 1941 averaged highest in weight per bushel. Protein percentage determined for the 1941 crop was for Chiefkan 16.3, Kanred 15.7, Comanche 15.7, Tenmarq, 15.5, Blackhull 15.0, Cheyenne 14.9, and Turkey 14.5. Mixed wheat, foreign material (rye), and smut reports, 1937–41, revealed a marked reduction in the amount of mixed wheat marketed. Rye and smut were also becoming less important as grading factors at inspection points in the State.

Winter wheat production in Colorado, D. W. ROBERTSON, J. J. CURTIS, D. KOONCE, J. F. BRANDON, and O. H. COLEMAN. (Coop. U. S. D. A.). (*Colorado Sta. Bul. 470 (1942), pp. [23], figs. 2*).—Cultural methods and field practices, derived from experiments and experience, are outlined for growing winter wheat on dry land and under irrigation. Results of further (E. S. R., 70, p. 330) varietal trials, 1933–40, at Akron on dry land, under irrigation at Fort Collins (5,000 ft.), and Fort Lewis (7,610 ft.) recommended Kanred, Tenmarq, and Nebred as the best-adapted hard red winter wheats.

Rate and date of seeding winter wheat in eastern Colorado, D. W. ROBERTSON, J. F. BRANDON, H. FELLOWS, O. H. COLEMAN, and J. J. CURTIS. (Coop. U. S. D. A.). (*Colorado Sta. Bul. 472 (1942), pp. 9, figs. 4*).—The main conclusions from these experiments have been noted from another source (E. S. R., 87, p. 218).

Wheat production in California, C. A. SUNESON and F. N. BRIGGS. (Coop. U. S. D. A.). (*California Sta. Bul. 659 (1941), pp. 18, fig. 1*).—Yields, 1922–40, and other agronomic characters, results of milling and baking tests, and descriptions are given for wheat varieties under study. Methods of producing the crop, its diseases and insect pests and their control, and commercial uses are reviewed, and the backcrossing procedure used to improve California wheat is

described. Baart, White Federation, and Big Club currently comprise 60 percent of the total wheat acreage. Transfer, by backcrossing, of resistance to stem rust and to smut from nonadapted wheats to these three varieties probably will have enough practical value to increase their culture to 85 percent of the total California acreage within 5 yr. Certain of the poorer-yielding varieties, as Pacific Bluestem and Big Club, have advantages for hay or pasture that justify production in certain situations.

Protein and quality in hard red spring wheat with respect to temperature and rainfall, L. R. WALDRON, R. H. HARRIS, T. E. STOA, and L. D. SIBBITT (*North Dakota Sta. Bul. 311 (1942), pp. 20, fig. 1*).—When eight wheat varieties were grown in four localities in North Dakota, 1937–40, the mean protein content of the wheats varied decidedly from year to year but relatively little from one locality to another. The protein content of Thatcher, 15.1 percent, was 1.3 above Marquis, but it was not evident that this difference was due to stem rust. Errors of estimate of loaf volume calculated from the protein content showed high values for 1937 and 1938 and low values for the last 2 yr. Thus protein showed marked differences in efficiency in different years. High maximum and minimum temperatures for the 10-day preheading period have been associated with greater loaf volume, but only high maximum temperatures were found associated with high protein. A smaller degree of correlation was found between similar temperatures and loaf volume and protein for the first half of the post-heading period. For the second half of the post-heading period loaf volume was correlated negatively with maximum and minimum temperatures, and for the same period correlations between temperatures and protein content were near zero. No relationship was found between protein content and precipitation, which was not high during the period.

Proceedings of the Association of Official Seed Analysts, 1941 (*Assoc. Off. Seed Anal. Proc., 33 (1941), pp. 106, figs. 17*).—Papers presented at the thirty-third annual meeting at Ames, Iowa, July 8–11, 1941, included Germination of Green Foxtail Seeds, by A. C. Heise (pp. 43–44); Germination of Seeds of *Agropyron* sp. (Probably Quack Grass) and *Thlaspi arvense*, Penny Cress, by R. B. Schulte and P. Balbach (pp. 44–45); Viability of Injured Seeds of *Avena fatua* L., by E. R. Clark (pp. 46–47), The Pretreatment of Buffalo Grass for Field Planting—A Preliminary Report, By A. F. Musil (pp. 76–82), and Germination of Freshly Harvested Seed of Kentucky Bluegrass (pp. 96–98) and The Effect of Different Temperatures on the Germination of Freshly Harvested and Mature Seed of *Axonopus compressus* (pp. 99–102), both by A. M. Anderson (all U. S. D. A.); Viability of Injured Weed Seed, *Bromus tectorum*, by L. A. Kanipa (pp. 48–50) (Oreg. Expt. Sta.); The New Iowa Seed Law, by H. D. Linn (pp. 58–60); Test for Homogeneity in Seed Germination Tests, by R. G. Cochran (pp. 60–63), with discussions by C. W. Leggatt and R. H. Porter; Evaluation of Media for Seed Germination, by V. J. Thompson (pp. 63–64), Viability and Germination of Seeds of Field Bindweed, *Convolvulus arvensis* L., and Other Noxious Weeds, by E. O. Brown and R. H. Porter (pp. 64–65), and Effect of Low Temperatures on the Germination of Sorghum and Soybean Seeds, by W. A. Robbins (pp. 95–96) (all Iowa State Col.); and Split Seeds in Peas and Beans, by W. Crosier (pp. 66–69), Some Observations in the Germination of Grass Seeds, by W. Crosier and B. Cullinan (pp. 69–74), Germinating Seeds of Southern Grasses, by B. Cullinan (pp. 74–76), The Production of Clover Seed, by L. E. Iverson (pp. 82–84), Laboratory Germination of Belladonna (*Atropa belladonna*) Seed, by C. E. Heit (pp. 84–87), Approximate Germination Tests of Dormant Seeds by Exclusing Embryos, by C. E. Heit and C. Nelson (pp. 87–89), New Zealand

Spinach Germination Studies, by C. E. Helt and M. T. Munn (pp. 90-95), and Some Seed Control Field Problems, by M. T. Munn and B. E. Clark (pp. 103-104) (all N. Y. State Sta.).

Technical problems were also dealt with in committee reports.

HORTICULTURE

[Horticultural studies by the Pennsylvania Station] (*Pennsylvania Sta. Bul.* 414 (1941), pp. 19-21, 30-34, 49-53, 54, figs. 3).—Included are reports of studies on the culture and fertilization of roses, by E. I. Wilde and R. P. Meahl; the breeding of snapdragons, by M. T. Lewis; the testing of aster species and varieties, by Wilde; the use of growth-promoting chemicals on the cuttings of ornamentals, by Meahl; soil management of apple, peach, and cherry orchards, by R. D. Anthony, C. O. Dunbar, W. S. Clarke, Jr., and N. Shaulis; the K requirements of peach trees, by Anthony, E. C. Dunkle, and F. G. Merkle; rootstocks for apples and cherries, by Clarke and Anthony; the use of growth-promoting substances for apple and cherry cuttings, by H. K. Fleming; the relation of cold spots in orchards to losses of fruit crops, by Clarke; the breeding of rhubarb, tomatoes, and lettuce, by C. E. Myers and Lewis; the testing of vegetable varieties, by E. M. Rahn; the testing of hybrid sweet corn, by Myers; the use of starter solutions for tomatoes, by Rahn; fertilizer placement with tomatoes; the relation of irrigation to economy of fertilizing vegetables, by G. J. Stout; and composts for mushrooms, by J. W. Sinden.

Fruits and vegetables (*South Dakota Sta. Rpt.* 1941, pp. 49-50, 51-54).—Among studies, the progress of which is reported by N. E. Hansen, W. F. Buchholtz, L. L. Davis, and S. A. McCrory, are the testing of new ornamentals, breeding of fruits, breeding of roses, development of apricots with sweet kernels, the Siberian apricot as an ornamental, polyploidy in the apple, development of new varieties of tomatoes, growth of various trees and shrubs in the shelterbelt as influenced by fertilizer and culture, and the breeding of hybrid sweet corn.

[Horticultural studies by the Wisconsin Station] (*Wisconsin Sta. Bul.* 455 (1942), pp. 57-62, 64, 66, 73-74).—Information is given on the progress of studies by J. C. Walker, J. P. Jolivet, W. W. Hare, K. Berger, E. Truog, E. J. Delwiche, L. Muskavitch, O. B. Combs, W. B. Ennis, R. H. Andrew, and N. P. Neal dealing with the effect of borax on canning peas, the fertilization of canning peas, canning pea varieties, tomato varieties, the spraying of tomatoes, the value of hybrid varieties of sweet corn, fertilizers for sweet corn, the application of borax to beets, fertilizers for beets, the use of copper and boron for celery grown on peat soil, and the resistance of red raspberries to low-temperature injury.

A rapid method of determining when a plant is killed by extremes of temperatures, G. A. FILINGER and A. B. CARDWELL. (Kans. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 85-86, fig. 1).—Resistance measurements made with a standard bridge were found useful in determining when plant tissues had been killed. Red raspberry canes killed by freezing or boiling lost from 72 to 82 percent of their resistance.

The effects of fertilizers, organic material, and irrigation on the yield of certain truck crops, L. M. WARE. (Ala. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 363-366).—Three years' results are presented on the yield of certain truck crops grown in concrete bins of uniformly prepared soil treated differentially with respect to organic matter and water. Commercial fertilizers were applied in like amounts to all plats. In the first year with adequate rain throughout the growing season and no build-up of organic matter in

the soil, no benefit resulted from the use of either organic matter or irrigation for either of the spring crops potatoes and beans. After the first year, while irrigation and organic matter used singly gave slight to large increases in yield, the maximum increases were attained only when the two were used in combination. Attempts to grow organic matter on the plats rather than to introduce it from outside sources were successful. Fall seedings of vetch gave very promising results, and cowpeas also showed promise for preceding fall-grown crops.

Limits in the use of borax in the production of certain vegetable crops, R. H. WHITE-STEVENS. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), p. 367).—Among vegetable crops grown on Long Island, cauliflower, rutabagas, table beets, mangolds, and radishes showed particular need for boron. In some cases boron increased the yields of potatoes and peas, particularly when grown on soils which had produced cauliflowers showing boron deficiency symptoms. With peas and potatoes 5 lb. of borax were adequate, and greater amounts tended to reduce yields particularly if repeated for several years. Snap beans, lima beans, spinach, and carrots did not give increased yields with 5 lb. of boron per acre, and larger amounts decreased yields. Sweet corn did not respond to borax up to 20 lb. per acre. In wet seasons higher rates of borax are needed than in dry years. The inclusion of small amounts of borax in bordeaux mixture or in water was found to be an effective means for supplemental applications.

Storage of vegetable seeds, E. H. TOOLE (*U. S. Dept. Agr. Leaflet* 220 (1942), pp. 8, figs. 2).—Information is given on the importance of conserving seed supplies, general principles of seed storage, moisture changes in seeds, maintenance of seed viability, cold storage as a means of preserving viability, methods of drying seeds, etc.

[Vegetable studies by the Illinois Station] (*Illinois Sta. Rpt.* 1938, pp. 281-296).—Among studies by J. W. Lloyd, J. P. McCollum, W. A. Huelsen, and K. J. Kadow, the progress of which is noted, are the effect of time of plowing under cover crops, the effect of the severity of cutting on asparagus yields, methods of fertilizing asparagus, breeding of disease-resistant cabbage and high-quality onions, breeding of sweet corn, effect of stand of plants on sweet corn yields, tomato breeding, fertilization of greenhouse tomatoes, adaptation of new varieties of lima beans for freezing preservation, tomato spraying, culture of the horseradish, and tomato cultural practices.

Yield of sweet corn in relation to distance and rate of planting, W. A. HUELSEN (*Illinois Sta. Bul.* 487 (1942), pp. 33-104, figs. 32; abs., pp. [4]).—Preliminary experiments with 50 different checked-row and 40 different drilled-row plantings of Country Gentleman and Narrow Grain Evergreen sweet corn indicated that changing the distance between rows, the number of plants to the hill, and the spacing between plants in the rows had a highly complex and varying effect on yields. Further studies with 16 different checked-row and 12 different drilled-row plantings replicated four times made possible an analysis of the differential effects on several of the yield components of both varieties. The nature of the yield variations was such as to suggest that while space occupied per plant may have strongly influenced yields, other factors exercised a partially independent effect. The weight of usable unhusked and prime husked ears tended to respond in the same manner as weight of green fodder and height of plants, but the relationship was not very close. In general, planting distances and rates that were favorable for maximum production of one yield component were not necessarily favorable for others. Varieties responded differently to changing rates and distances of planting. However, in drilled rows, plantings of Narrow Grain Evergreen and Country Gentleman reacted practically the same, with the correct

distances between rows being more important than correct distance between plants in the row. In dry years a decrease in distance between hills reduced the height of plants, but increasing the number of plants in the hill had only a slight effect on plant height. Maturity was delayed much more by an increase in rate per hill or by closer planting in the row than it was by reducing the distance between rows.

Cucumber growing, W. R. BEATTIE (*U. S. Dept. Agr., Farmers' Bul. 1563, rev. (1942), pp. 11+25, figs. 15*).—Replacing an earlier publication (E. S. R., 59, p. 742), this contains general information as to soils, culture, pollination requirements, harvesting, marketing, control of pests, etc.

Growing garlic in the North, D. COMIN (*Ohio Sta. Bimo. Bul. 215 (1942), pp. 70-71*).—Spring plantings of garlic failed to give either large-sized bulbs or sufficient yields. Where local strains of garlic were planted in October much better production was obtained, and over a 4-yr. period the local stocks proved to be winter hardy.

The effect of storage on the carbohydrates of the Ebenezer onion, E. BENNETT. (Mass. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 39 (1941), pp. 293-294*).—Analyses of onions, grown under known conditions and stored in (1) high temperature and low relative humidity, (2) low temperature and high relative humidity, and (3) conditions intermediate between lots 1 and 2, showed the greatest loss, 8.12 percent, of total sugars in the period November 1 to February 15 in the onions of lot 1. The losses were not large, even under the most adverse conditions. The largest percentage of marketable onions was obtained from the storage having the lowest mean temperature and the highest mean relative humidity. Decayed onions were negligible in all three environments. Sprouting was minimized by holding the temperature at about 32° F.

The vernalization of tomato seed, D. W. GOODALL and B. D. BOLAS (*Ann. Appl. Biol., 29 (1942), No. 1, pp. 1-10*).—Tomato seeds of the Potentate variety were chilled in a moist state, but before germination, at temperatures of 0°, 2°-3°, 7°, and 8°-11° C. for periods of 10 to 20 days. Later they were germinated, together with control seeds, under conditions of both restricted and fully adequate moisture. The plants grown from chilled seeds produced the more fruit, particularly during the first few weeks of cropping. Their first two leaves were opposite in a greater proportion of instances, the effect being more marked after treatment at the higher temperatures. Both leaf area at a given date and fruit size during the first weeks of cropping were greater in the series germinated with a full moisture supply than in those with restricted moisture. The dates of first flowering and fruiting were not affected by the treatments.

The interactions between variety, spacing, and staking of tomato plants, T. M. CURRENCE. (Minn. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 39 (1941), pp. 315-318*).—Maximum early production was obtained from close spacing, 1 ft. between plants giving the highest yields for the first five pickings. Varieties responded differently to pruning; for example, Break o' Day (of standard growth habits) benefited from pruning, while Pritchard (of determinate growth habits) was harmed. The total yields of all varieties were uniformly reduced by pruning. Yields of plants staked without pruning were approximately equal to those of untreated plants. Yields of the Dwarf Champion variety were reduced drastically by a combination of pruning and staking. Fruit size was increased by staking, and particularly by staking plus pruning.

Effect of indolebutyric acid upon tomato fruit set and development, F. S. HOWLETT. (Ohio Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 39 (1941), pp. 217-227, figs. 4*).—Indolebutyric acid proved to be very effective, both in number and size of fruits produced and in the extensive development of gelatinous pulp

within the locules. Equally good results were obtained when the chemical was used to supplement pollen of low viability. The chemical used in the form of lanolin emulsion was frequently superior to the paste form, except that it caused considerable blossom-end rot.

[Pomological studies by the Illinois Station] (*Illinois Sta. Rpt. 1938, pp. 263-266, 267-270, 271-279, 280-281, fig. 1*).—Progress reports by J. C. Blair, M. J. Dorsey, J. S. Whitmire, W. A. Ruth, R. L. McMunn, W. P. Flint, A. S. Colby, and H. W. Anderson are presented on the following studies: Apple breeding; apple tree training; fertilization of apple trees; comparative resistance of apple varieties to low temperature; removal of spray residues from apples; effect of different soil management practices on soil moisture availability for apple trees; the testing of Chinese peach seedlings; peach breeding; lespedeza as a cover crop for peach orchards; peach fruit thinning; effect of low winter temperatures on peaches, cherries, and plums; the value of the mahaleb cherry as an understock; grape cluster thinning; the testing of nut and small fruit varieties; the breeding of strawberries for resistance to red stele disease; and the breeding of gooseberries and black raspberries.

Fruit varieties for Ohio: Descriptions of recommended and new varieties, with planting directions, C. W. ELLENWOOD, L. HAVIS, and F. S. HOWLETT (*Ohio Sta. Bul. 627 (1942), pp. [1]+50, figs. 8*).—Accompanied by brief directions as to the selection of orchard sites and planting plans and methods, data are presented on varieties of tree and small fruits for commercial, roadside market, and home uses. In tabular form data are presented on the color of flesh, size of fruit, quality, approximate ripening dates, and principal uses of a large number of peach varieties grown at Wooster.

The home fruit garden in the East Central and Middle Atlantic States (*U. S. Dept. Agr. Leaflet 218 (1942), pp. 8, figs. 2*).—This leaflet lists the best kinds and varieties of fruits and nuts for home planting in the middle region of the eastern United States, and gives brief directions for their planting and care.

The home fruit garden in the southeastern and central Southern States (*U. S. Dept. Agr. Leaflet 219 (1942), pp. 8, figs. 2*).—This leaflet lists the best kinds and varieties of fruits and nuts for home planting in the southeastern United States and gives brief directions for their planting and care. The region is divided into climatic districts.

Establishing and managing young apple orchards, J. R. MAGNESS (*U. S. Dept. Agr., Farmers' Bul. 1897 (1942), pp. 11+29, figs. 16*).—This paper discusses the need for planting orchards, the selection of desirable locations, the planning and planting of the orchard, soil management, pruning, spraying, etc.

Some correlations between growth and yield of the apple in central Washington, E. L. OVERHOLSER, F. L. OVERLEY, and J. C. WILCOX. (*Wash. Expt. Sta.*). (*Amer. Soc. Hort. Sci. Proc., 39 (1941), pp. 11-15*).—A study of growth and yield records available on Jonathan, Rome Beauty, and Winesap trees showed highly significant positive correlations between cross-sectional area of trunk and increase in trunk circumference and between cross-sectional area of trunk and growth index in Jonathan and Rome Beauty. In general, the larger trees tended to be more vigorous than smaller trees. Correlations between terminal length and weight of fruit, between increase in trunk circumference and weight of fruit, and between growth index and weight of fruit were all highly significant in the case of Jonathan. The same tendencies were noted in Winesap, but were not as pronounced in Rome Beauty. Apparently increase in trunk circumference and growth index was preferable to terminal length as a measure of tree growth over a period of years.

In a group of Jonathan trees, in which very little tendency toward systematic biennial bearing was noted over a period of years, a distinct tendency was noted for a comparatively heavy crop to be followed by a comparatively light crop, and vice versa. The sequence lasted rarely for more than 2 or 3 yr. at any one time. Terminal growth tended to be longer in the "on" year than in the "off" year. The increase in trunk circumference tended to be smaller in the on than in the off year.

Influence of sulphur sprays on the trunk diameter of young apple trees, E. P. CHRISTOPHER. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 8-10).—Measurements taken on trunk diameter increments of McIntosh and Baldwin trees following 2 yr. of various spray and dust treatments showed significant effects in only a few instances. McIntosh and Baldwin trees dusted with sulfur were significantly larger than those treated with liquid lime-sulfur 1 : 50. Baldwin trees sprayed with liquid lime-sulfur 1 : 100 were larger than those sprayed with liquid lime-sulfur 1 : 50.

The Idared apple, L. VERNER (*Idaho Sta. Cir.* 84 (1942), pp. 3).—The new variety, resulting from a cross of Wagener and Jonathan, is described as to tree and fruit characters. The fruit is bright red in color and has a very small core, creamy-white flesh, and superior keeping qualities.

Effect of ringing upon fruit set in some light-setting apple varieties, F. S. HOWLETT (*Ohio Sta. Bimo. Bul.* 216 (1942), pp. 107-112).—Experiments extending over a period of years led to the conclusion that, although ringing did increase fruit set significantly in some instances, its general use was not justified under Ohio conditions for increasing the fruit set of light-setting varieties. In some cases one pair of branches on a tree gave a favorable response to ringing, while another pair showed no response. Apparently, different chemical compositions may exist among the branches of a single tree. Under certain conditions ringing might be profitably used on such varieties as Paragon, Arkansas, and Nero. Ringing wounds should be carefully protected to promote healing. The time of ringing should be from the late-pink to the full-bloom stage. The fact that certain of the light-setting varieties are triploids and possess considerable egg cell sterility suggests the need of providing for effective cross-pollination and for keeping the trees in vigorous condition rather than using ringing as a means of increasing fruit set.

Regulating apple production with sprays to remove flowers, F. S. HOWLETT. (*Ohio Expt. Sta.*). (*Ohio State Hort. Soc. Proc.*, 75 (1942), pp. 91-100).—Various materials were tested as sprays which would reduce the set of apples sufficiently in the bearing year to permit flower buds to form for the succeeding light-crop year. Apple varieties were found to differ considerably in their response to a given treatment; for example, Elgetol at 0.6-percent concentration removed the flowers and fruit of Cortland and Melba but had little effect on Anoka, Ralls, and Baldwin. The flowers in the "on year" were apparently unusually vigorous and when cross-pollinated were capable of setting despite pronounced injury to the adjacent leaves. Annual bearers had a considerable proportion of weak flowers, many of which were easily prevented from setting. The timing of the sprays and the different materials are discussed, with a warning that the entire problem is still definitely in the experimental stage.

Preharvest sprays in 1940 and 1941, C. W. ELLENWOOD and F. S. HOWLETT (*Ohio Sta. Bimo. Bul.* 216 (1942), pp. 100-106).—In 1940, five commercial materials and home-made naphthaleneacetic acid solution were compared on several varieties of apples. There was no significant difference between the various materials on any one variety. On Jonathan and Stayman Winesap the sprays

caused a highly significant reduction in drop. On Baldwin, the results were not significant. The timing of sprays was highly important. For example, with Stayman Winesap an application on October 11 was not effective while that on October 16 reduced dropping by 15.8 percent compared with check trees. The condition of the foliage is believed highly important and possibly an explanation of the Baldwin results. In 1941, favorable responses were obtained with Duchess, Red June, Williams, Gravenstein, Melba, Wealthy, and Stayman Winesap. Again there was no appreciable difference between the materials used. In general a single application made 2 or 4 days preceding the normal date of beginning the harvest was as effective as two applications.

Sun-coloring experiments in 1941: Sun-coloring compared with use of harvest sprays as means of improving color, C. W. ELLENWOOD and T. E. FOWLER (*Ohio Sta. Bimo. Bul. 215 (1942), pp. 73-75*).—In 1941 a comparison was made of sun coloring McIntosh apples for 9 days with applications of preharvest sprays which caused the fruit to remain on the trees throughout the same period. Sun coloring gave better color and, although the apples softened appreciably, this did not interfere with their marketability. After 3 mo. of storage, both lots of fruit were approximately alike in firmness. Favorable results were obtained also from sun coloring Red Gravenstein apples. The response from sun coloring Gravenstein apples was much less marked than with the Red Gravenstein.

Irrigation experiments with pears and apples, A. H. HENDRICKSON and F. J. VEIHMAYER (*California Sta. Bul. 667 (1942), pp. 43, figs. 16*).—Studies on widely distributed plats of trees, some of which were kept continuously supplied with readily available moisture and some allowed to deplete the soil moisture to the permanent wilting percentage during certain periods, indicated that in the central-coast region in years of normal rainfall pear and apple trees on medium- or fine-textured soils do not exhaust the readily available moisture until late in the season. Mature pear orchards in districts where the climatic conditions resemble those of the interior valley, such as Lake, Mendocino, and Contra Costa Counties, exhaust the soil moisture to the permanent wilting percentage in the top 4 to 6 ft. about the last week in June or the first week in July and require one or two irrigations prior to harvest. When the readily available soil moisture is exhausted, the pear fruits slow down in growth on both medium- and fine-textured soil. However, if the permanent wilting percentage is not reached while the fruit is on the tree, its growth is not retarded.

In the apple studies conducted under mild climatic conditions, fruits slowed down in growth when the readily available moisture before the first foot was exhausted. If the permanent wilting percentage was not reached, the growth of fruit was not retarded.

As indicated by the pressure test, the maturity of pears was delayed if the readily available soil moisture was exhausted a week or more before the normal harvest period. Differences in maturity between fruit from the irrigated and nonirrigated plants tended to disappear in storage. Pears grew normally under a wide range of soil and climatic conditions, but harmful results such as decreased size and delayed maturity followed when the soil moisture was reduced to about the permanent wilting percentage during the growing season.

Relation of ripening temperature to market quality of Bartlett pears, C. O. BRATLEY and F. W. WILLEN. (U. S. D. A. and Univ. Calif.). (*Ice and Refrig., 102 (1942), No. 6, pp. 355-356, fig. 1*).—Observations on comparable lots of pears, one held in the cold storage plant at Davis, Calif., and the other shipped to New York City, indicated that pears which had been held at low temperatures ripened most effectively at moderate temperatures, 65°-70° F. Pears ripened at

83° or above softened more slowly than those held at 65°-70°. Some of the pears held at 83° failed to soften well and remained slightly firm until decay or break-down set in. Fruit which attained an edible condition kept essentially the same when placed at room temperature whether ripened at 65°-70° or at 83°.

Cultural factors affecting sour cherry production in Colorado. L. R. BRYANT and R. GARDNER (*Colorado Sta. Bul.* 471 (1942), pp. 19, figs. 3).—Interspersed with general information on the planning, cultural care, and pruning of Montmorency cherry orchards is information on the results of certain experiments. Attempts to develop organic matter in the cherry orchard by growing cover crops were impeded by shortage of moisture for both the tree and the cover crop. Moisture determinations on samples of soil collected periodically showed very little moisture available in excess of that needed by the trees and that before the end of the season in nearly every year the entire available supply was exhausted by the trees. Experiments showed that nitrogen applied either as commercial nitrogen or as stable manure increased yields significantly. The size of cherries was not influenced by fertilizer treatments but was increased by irrigation shortly before maturity of the fruit. Pruning decreased yields in order of severity, but a certain amount of light pruning is deemed essential.

Split-pit of peaches: Estimation of time when splitting occurs. L. D. DAVIS. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 183-189, figs. 5).—A method is described for estimating the time when pit splitting occurs by comparing the seasonal curves of the suture diameter : cross diameter ratio of the split and unsplit fruits calculated from the average size of the two diameters. The time when the curves rapidly diverge indicates when splitting begins. Fruits destined to have split pits are larger in both suture and cross diameters than nonsplitting fruits, and the ratio of the two diameters is smaller prior to pit hardening. The incidence of splitting may vary in different varieties in reference to the time pit hardening begins, and a single variety may show differences in time of splitting. Splitting occurred in all the cases studied after the pit began to harden. The differences in the seasonal changes of the suture diameter : cross diameter ratio in split and unsplit fruits are discussed.

Climate in relation to deciduous fruit production in California.—I, Effect of the warm winter of 1940-41 on peach and nectarine varieties in northern California, R. M. BROOKS and G. L. PHILP. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 190-194).—The results of a study of the effect of a mild winter on the fruiting performance of 280 peach and 58 nectarine varieties are presented, and the varieties are grouped in four classes: (1) No bud drop, (2) slight drop, (3) moderate drop, and (4) heavy drop. Most of the commercial varieties fell into classes 2 and 3. The varieties which showed little or no drop were mainly of the Honey or Peento groups.

An evaluation of peach and nectarine varieties in terms of winter chilling requirements and breeding possibilities. W. E. LAMMEETS. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 205-211, fig. 1).—A total of 50 varieties of peaches and nectarines were evaluated in terms of their winter chilling requirements, using the relatively constant reaction of Lukens as a standard for comparison. Some progress was made in the breeding of new varieties with a low chilling requirement by crossing high-quality commercial varieties with others having a low chilling requirement.

Blackberry growing. G. M. DARBOW (*U. S. Dept. Agr., Farmers' Bul.* 1399, rev. (1942), pp. 11+18, figs. 14).—In this revised edition (E. S. R., 51, p. 748), directions are given for locating the plantations, selection of soils, culture, propagation, pollination, training and pruning, winter protection, control of insects and diseases, and varieties for specific locations and for specific purposes.

Raspberry growing in New York: Culture, disease, and insects, G. L. SLATE, R. F. SUIT, and F. G. MUNDINGER (*New York State Sta. Cir.* 153, rev. (1942), pp. 62, figs. 16).—In this revision, the original of which was noted (E. S. R., 72, p. 624), information is presented on culture, pruning, varieties, harvesting, marketing, diseases and their control, noninfectious troubles such as winter injury, and insects and their control.

Inheritance of some characteristics in strawberry varieties, E. B. MORROW and G. M. DARBOW. (N. C. Expt. Sta. and U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 262-268).—Observations on a large number of seedlings produced at Beltsville, Md., and Raleigh, N. C., and grown to maturity at Willard, N. C., revealed some outstanding characteristics attributable to the parental stock. In the mild winter of 1938-39 many more selfed seedlings of Blakemore and Missionary flowered by the middle of February than all other selfed varieties or of any cross. The late-flowering performance of these early-blooming seedlings indicated that conditions that make for early flowering make also for further extensive fruit bud formation. Data taken in 1940 on the time of ripening showed Missionary selfed and N. C. 640 selfed to have many early-ripening seedlings. Among crosses, over one-half of N. C. 225 × Fairmore and of Blakemore × N. C. 640 were in the early-maturing group. The largest berries were produced by Blakemore × Dresden, Catskill × N. C. 866, Blakemore × Massey, Catskill × Massey, and Catskill × Blakemore. In selfed lines, seedlings of Eleanor Roosevelt, Fairfax, and Southland averaged large in size. Selfed lines of Fairmore, N. C. 866, Blakemore, Eleanor Roosevelt, and Fairfax had a large percentage of firm berries. Southland selfed was noticeably soft. In crosses, both Catskill and Dresden transmitted a high degree of softness. Promising parental combinations are listed.

Transpiration in strawberries as affected by root temperature, G. F. GRAY. (Okla. A. and M. Col.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 269-273, figs. 2).—In 1939, plants of several varieties were grown in water cultures maintained at 85° and 100° F. At 85° the plants functioned apparently normally, while at 100° wilting occurred during the heat of the day on one or more leaves of practically all the plants. Transpiration was not greatly different in the first 24 hr., but in the second 24 hr. it was much less at 100° than at 85°.

In 1940 with soil instead of water, all varieties functioned normally throughout a 3-day period at 100°, although the transpiration rate was higher at 100° than at 85°. Results of two 10-day trials showed that the plants transpired at a higher rate at higher soil temperatures but that atmospheric humidity had a more direct influence on transpiration than did air temperature. Observations on the roots in soil at 100° showed a majority of the small fibrous roots to have turned brown after 3 days, and what new growth appeared was practically devoid of root hairs. There was no injury at 85°.

Strawberries for the home garden, J. H. CLARK (*New Jersey Stat. Cir.* 436 (1942), pp. [4]).—Information is presented as to the desirability of early planting; value of vigorous, healthy plants; fertilizers; weed control; mulching; rotations; and varieties.

A caution on the use of arsenicals to clear cranberry bogs for replanting, C. A. DOEHLERT. (N. J. Expt. Stas.). (*Amer. Cranberry Growers' Assoc., Proc. Ann. Mtg.*, 72 (1942), pp. 11-15, 18-19, fig. 1).—On a Savannah bog near Pemberton, N. J., plowed in the spring of 1938 and rototilled during the summer to prepare for replanting, a half acre was sprayed at planting time in the spring of 1939 with an arsenical weed-killing solution sufficiently strong to kill grass and weeds. The bog was then covered with from 2 to 3 in. of sand and planted 2 weeks later with Early Black cuttings. Growth was very poor,

and many cuttings died. In general, there was a weak growth of vines and a moderate growth of some grasses and weeds. New cuttings planted 1 yr. later grew poorly or not at all. Growth on the no-arsenic areas was much better, although not optimum because the cuttings had been held too long prior to planting. An examination of vines on the arsenic plat showed roots in the top sand, none in the upper 2 in. of muck, and some in the muck below the 2-in. level. In contrast, on the untreated areas roots had formed on the entire length of the cuttings. Analyses of samples of muck collected 2.5 yr. after treatment showed 10 p. p. m. of As_2O_3 in the top 2 in. and in the second 2-in. layers. There were 5 p. p. m. in the 4- to 6-in. layer. The need of plowing deeply before planting to put the treated soil out of reach of the new cuttings is indicated.

Some problems affecting the rooting of hardwood blueberry cuttings, A. E. STENE and E. P. CHRISTOPHER. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 259-261).—Coldframes proved more effective than more expensive high box frames for the rooting of blueberry cuttings of the Pioneer, Rubel, and Cabot varieties. Drainage provided by a rock and gravel base gave about the same results as did trays with wire cloth bottoms. Peat alone was a satisfactory rooting medium, with indications that coarse peat was better than fine peat.

Manurial trials with irrigated sultana vines in the Murray Valley, Australia, D. V. WALTERS (*Empire Jour. Expt. Agr.*, 10 (1942), No. 38, pp. 77-88, fig. 1).—In carefully planned experiments with sultana grapes on their own roots, nitrogen proved to be the only fertilizer to give substantial and continued increases in yields of dried fruits. Sulfate of ammonia gave the greatest response, but dried blood containing an equivalent quantity of nitrogen was almost as effective. Cover crops were not consistently effective but had apparent accumulative beneficial effects. Phosphates and potash had no influence on yields.

The climacteric rise in respiration rate of the Fuerte avocado fruit, J. B. BIALE. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 137-142, figs. 2).—The respiratory activity of fruits of the Fuerte avocado at 15° C. was characterized by a rapid acceleration in CO_2 evolution, followed by a marked decrease. At the peak of activity from 120 to 150 mg. of CO_2 are produced by 1 kg. of fruit per hour. This quantity is equivalent to an increase of from 100 to 200 percent over the initial rate. The anaerobic respiration rate was found to be much lower than the aerobic rate with no climacteric rise and no softening of the fruit.

Effect of severity of pruning on top regeneration in citrus trees, S. H. CAMERON and R. W. HODGSON. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 67-72, fig. 1).—A study of the rate of top regeneration following light, medium, and heavy pruning of twenty-three 10-year-old citrus trees, representing two varieties of orange and one each of lemon and grapefruit, led to the conclusion that the rate of top regeneration and resumption of fruiting during the first 2 yr. is inversely proportional to the severity of the pruning. Lightly pruned trees reestablished a full complement of leaves during the first year after pruning, while severely pruned trees required 2 yr. or more to produce leaves equal in weight to those removed. Under conditions where tree growth is uniform an equally accurate calculation of the rate of top regeneration can be made on the basis of fresh weight of the above-ground parts of the tree, or of the branches and leaves alone, as upon the total weight of the tree.

An evaluation of some of the factors affecting quality of grapefruit in commercial groves of the Salt River Valley, W. E. MARTIN. (Univ. Ariz.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 59-66, figs. 3).—Based on studies of a

large number of commercial groves and records thereon, it became evident that, in spite of variations in the form of nitrogen used, time of application, and amount applied, nitrogenous material had an increasing effect on production. Manure and calcium nitrate appeared superior to ammonium sulfate. The growing of winter cover crops did not appear markedly beneficial, possibly because of an interference with the uptake of nitrogen by the trees at a time when it was needed to insure production. As yields increased up to about four boxes per tree, quality improved. Beyond this point there was no apparent effect on quality. Summer cover crops as compared with clean culture tended to improve quality. Water supplied in quantities less than 3 acre-ft. seemed to make for poor quality, which in this paper refers to comparative marketability.

Second report upon cold storage of date pollen, W. W. ALDRICH and C. L. CRAWFORD. (U. S. D. A.). (*Date Growers' Inst. Rpt.*, 18 (1941), p. 5).—In continuation of these studies (E. S. R., 81, p. 652), pollen was held successfully from one season to the next in a household refrigerator maintained at about 40° F. The pollen kept well when placed in a small glass container with an open top, this container being placed in a larger jar with an airtight lid and with calcium chloride enclosed to absorb moisture.

Carbohydrate changes in the date palm during the summer, W. W. ALDRICH and T. R. YOUNG, JR. (U. S. D. A. et al.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 110–118, figs. 9).—A high starch content of the palm trunk in early summer, followed by a downward trend during June and July, in nonfruiting palms suggests that during hot weather the respiration of leaves and trunk and the growth of roots, leaves, and trunk draw heavily on reserve carbohydrates. Depletion of starch in the trunk samples of fruiting palms preceding or during fruit ripening indicated that a heavy crop draws on the carbohydrate reserves. With reserves tending to decrease during the June to August or September period, apparently because photosynthesis is less than utilization, it follows that during the October to May period photosynthesis must exceed utilization. Removal of lower leaves when necessary should be done as late in the spring as possible.

Composition of dates as affected by soil fertilizer treatments, W. B. SINCLAIR, E. T. BARTHOLOMEW, and D. E. BLISS. (Calif. Citrus Expt. Sta.). (*Date Growers' Inst. Rpt.*, 18 (1941), pp. 11–16, figs. 3).—Analyses of dates harvested from differentially fertilized Deglet Noor palms revealed little or no difference in chemical composition that could be attributed to the fertilizer treatments. Yields were largest on the plats receiving only ammonium sulfate and lowest on the unfertilized plats. Quality was closely related to the physical environment under which the fruit was grown and also to the type of bunch management used.

Relation of water supply by the date palm to water injury of the fruit, W. W. ALDRICH and D. C. MOORE. (U. S. D. A.). (*Date Growers' Inst. Rpt.*, 17 (1940), pp. 3–5, fig. 1).—Water injury to date fruits following a period of rain or high relative humidity was apparently influenced by the water supply from the palm to the fruit, as well as by water absorbed directly from the air through the skin. A reduction in irrigation water at certain periods was found to reduce the checking of Deglet Noor and calyx loosening of the Saily variety. However, because of possible undesirable effects of reducing water supply to the palms, this practice is not recommended at the present time.

The deterioration of dates, E. M. MEAK. (Univ. Calif.). (*Date Growers' Inst. Rpt.*, 18 (1941), pp. 3–4).—The different types of date deterioration are discussed, with particular attention to microbial spoilage. A slow type of fermentation caused by sugar-tolerant yeasts may occur during the storage of undercured dates and is usually caused by a species of yeast belonging to the

genus *Zygosaccharomyces*, all species of which under study were unusually tolerant to high concentrations of sugar. Two other yeast genera, *Hanseniaspora* and *Candida*, also found in dates, were less tolerant to sugar. The use of cold storage is deemed one of the best methods of reducing microbial spoilage.

Aeration as a factor in reducing fruit spoilage in dates, D. E. BLISS and R. O. BREAM. (Calif. Citrus Expt. Sta.). (*Date Growers' Inst. Rpt.*, 17 (1940), pp. 11-15, figs. 2).—Following fruit thinning, bunches of Deglet Noor dates were separated by the insertion of wire rings which spread the fruit strands apart so as to provide a circular opening of about 8 in. in the center of the bunch. Although the wire ring did not prevent the deposition of moisture on the fruits during periods of rainfall and high relative humidities, it did increase the rate of evaporation of water from the dates after the rain. The manufacture of the rings is described. Paraffined bags placed over the bunches of dates were helpful in reducing losses, particularly when regular-type nonperforated bags were used. Nonparaffined bags tended to keep the outer dates moist and to promote their decay.

Papaya production in the United States, H. P. TRAUB, T. R. ROBINSON, and H. E. STEVENS (*U. S. Dept. Agr. Cir.* 633 (1942), pp. 36, figs. 8).—General information is presented on breeding, pollination requirements, varieties, propagation and planting, soil management, diseases, insects, nematodes, etc. Fertilizer experiments failed to show any marked differences in growth responses, although the highest rates of application tended to give a more sturdy type of plant. As to yield, there was little difference between the low and medium applications but there was a decided increase from the use of heavy applications. A combination of close spacing and high rates of fertilizer application was especially effective in the case of semidwarf varieties. Sugar analyses made by the saccharimeter method failed to show any effect of differential fertilizer treatments but did bring out the fact that the sugar in ripe papayas consists almost entirely of glucose.

Floriculture: Fundamentals and practices, A. LAURIE and V. H. RIES (*New York and London: McGraw-Hill Book Co.*, 1942, pp. VII+496, pl. 1, figs. 67).—Designed primarily as a text for instruction, this book discusses the principles and practices of growing ornamentals and includes the newer developments such as soilless culture and the use of growth-promoting substances.

[Floricultural studies by the Illinois Station] (*Illinois Sta. Rpt.* 1938, pp. 296-298).—Studies by F. F. Weinard, S. W. Hall, and H. B. Dorner include the fertilization of greenhouse roses, effect of K on the splitting of carnation flowers, nutrient solution cultures for greenhouse flowers, and the nutrient and soil reaction needs of the gardenia.

The rose Crimson Rambler and its progenies, C. D. PARIS and T. J. MANEY. (Iowa Expt. Sta.). (*Iowa Acad. Sci. Proc.*, 47 (1940), pp. 65-74).—An examination of records revealed that, up to 1939, 328 varieties of roses have been named which can be traced back to Crimson Rambler parentage. The data are presented chiefly in tabular form.

Control of defoliation in cut holly by use of hormone sprays, J. A. MILBRATH and H. HARTMAN. (Oreg. Expt. Sta.). (*Oreg. State Hort. Soc. Ann. Rpt.*, 33 (1941), pp. 42-43).—Dipping holly branches into vats containing a solution of certain proprietary growth-promoting substances was found effective in retarding the dropping of leaves. The holly branches should not be allowed to soak in the liquid and should be drained promptly after immersion. No injury was noted except where concentrations much higher than recommended were used. The dipping was effective over long periods, even when the holly was packed wet or exposed to ethylene contamination such as would occur if holly was stored with ripening fruits.

FORESTRY

Forests of the Illinoian till plain of southeastern Indiana, A. G. CHAPMAN. (U. S. D. A.). (*Ecology*, 23 (1942), No. 2, pp. 189-198, figs. 9).—Studies of the forests of the Illinoian till plain, an area characterized by poor drainage and high water-holding capacity, showed three fairly definite successions of forest cover. The first was the typical upland swamp stand of sweetgum, red maple, and pin oak; the second, a modification of the gum-red maple thickets by the establishment of yellow poplar, black cherry, sugar maple, and shagbark hickory; and, the third, a composition resembling the original forest, brought about by the development of seedlings of beech and, on the better-drained areas, white oak, hickory, black cherry, and sugar maple. The Illinoian till plain has a high potential capacity for producing wood volume, and it is considered practicable to control the stand composition in part by cutting methods and by disturbance of the surface soil.

[**Forestry at the Pennsylvania Station**] (*Pennsylvania Sta. Bul.* 414 (1941), pp. 21-22, fig. 1).—Observations are presented on the progress of the following studies: The comparative value of rapid- and slow-growing chestnut oak for pulpwood, by J. Bethel; direct seeding of Virginia pine on abandoned fields, by W. C. Bramble; the comparative sugar content of the sap of sugar maples growing in the open and in forest stands, by W. E. White, D. D. Stevenson, and H. Triebold; and the preference of deer and rodents for different forest species, by Stevenson.

[**Forestry studies by the Wisconsin Station**] (*Wisconsin Sta. Bul.* 455 (1942), pp. 76-78, figs. 2).—Among studies considered by B. Henry, A. J. Riker, R. V. Olson, S. A. Wilde, and R. O. Rosendahl are a survey of the vigor of red and white pine plantings, the growth of forest seedlings in nutrient solutions, and the inoculation of evergreen seedlings with mycorrhizal fungi.

Twenty years' results of plantation thinning at Biltmore, N. C., E. H. FROTHINGHAM. (U. S. D. A.). (*Jour. Forestry*, 40 (1942), No. 6, pp. 444-452, figs. 5).—Observations in thinning plots established in the fall of 1916 in two stands of pure white pine, one of white and shortleaf pines, and one of white pine and sugar maple suggested that repeated moderate thinnings are profitable, not only for salvage but for increased growth and quality of the remaining trees. In one of the white pine stands the salvage alone from the thinned area was at the rate of $\frac{1}{2}$ cord per acre per year and the annual growth was 1 cord per acre as compared with 1.1 cords in the unthinned stand. The improvement in quality was shown in the fact that in 1936 the trees averaged 8.2 and 5.6 in. d. b. h. in the thinned and unthinned areas, respectively. A too heavy initial thinning yielded results which were not fully as favorable in the second white pine stand. Good results obtained in the mixed stands led to the general conclusion that thinning was advantageous in terms of volume growth and quality.

Crop tree measurements in thinning experiments, W. R. ADAMS and G. L. CHAPMAN. (Vt. Expt. Sta.). (*Jour. Forestry*, 40 (1942), No. 6, pp. 493-498).—A study of data taken in plantations of white pine, jack pine, and red pine showed that the differences in the measurements of trees which are to constitute the final crop in stands of different densities of stocking were not as pronounced as similar measurements for the entire stand. Competition between individuals in the young stand may be shown to be severe when the measurements of all individuals are considered, and relatively minor in character when only the final crop trees are included. The authors suggest that an analysis of measurements following thinning practices should show not only

the increment of the stand as a whole but also the effect of the operation on the increment of selected crop trees.

Seedlings as experimental material in the study of "redwood" in conifers, H. F. WERSHING and I. W. BAILEY (*Jour. Forestry*, 40 (1942), No. 5, pp. 411-414, figs. 4).—Earlier investigations indicated that compression wood or redwood is formed in conifers in response to some form of geotropic stimulus. An examination of small seedling eastern white pine indicated that the hypocotyledonary parts of the stem formed typical redwood and that it may be induced to form during the first growing season and very early in the season. The application of indoleacetic acid to the hypocotyledonary stem of seedlings produced a conspicuous increase in girth both at and below the level of application. The increase was due in part to enlargement of the cortical cells and in part to accelerated cambial activity. The xylem formed by the stimulated cambium is commonly of the redwood type. The auxin application resulted either directly or indirectly in (1) cell enlargement of cortical cells, (2) accelerated cambial activity, and (3) a much modified type of tissue differentiation in the xylem.

Use of Ozark white cedar in the upper Mississippi region, H. A. STEAVENSON and A. F. DODGE. (U. S. D. A.). (*Jour. Forestry*, 40 (1942), No. 5, pp. 415-418).—The Ozark white cedar was found resistant to cedar apple rust and capable of withstanding heat, drought, and other adversities. Studies in a seedling nursery in Missouri and in demonstration plantings in southern Illinois and southern Missouri revealed that the Ozark cedar is unusually difficult to transplant. When compared with the common eastern red cedar the Ozark was an almost complete failure in field plantings. The species was apparently not winter hardy much north of its usual limits near the Arkansas-Missouri line.

Reproduction of ponderosa pine at low elevations in the Sierra Nevada, F. S. BAKER. (Univ. Calif.). (*Jour. Forestry*, 40 (1942), No. 5, pp. 401-404).—In the Sierra Nevada region of California there exists below the 2,000-ft. elevation a belt in which the ponderosa pine grows excellently but its reproduction is very difficult on account of drought. Some reproduction occurs and is facilitated where the surface mineral soil is disturbed. Successful silviculture depends upon the control of competing vegetation, chiefly the chaparral species. The only economical method is to suppress and kill out the brush by maintaining dense stands of pine. Once such stands are attained, their regeneration is possible by any method that promptly frees the reproduction from competition with the parent stands. Such reproduction can be obtained by a number of methods, such as small clear cuttings, shelterwood, a scattered seed tree system, or a selection system with cuts heavy enough to open up the forest fairly radically. Light burning has no place in the program of developing a dense forest.

One-parent heredity tests with loblolly pine, L. S. MINCKLER. [U. S. D. A.]. (*Jour. Forestry*, 40 (1942), No. 6, pp. 505-506).—An analysis of records taken on progenies of seedlings grown from seed taken from individual trees showed no correlation between juvenile height growth and any observable characteristics of the adult mother trees. There were statistically significant differences in both growth and survival of progenies from different parents. The mean growth in four randomized plats of the best progeny was 8.3 ft. and of the poorest 5.4 ft. in 4 yr. Maximum survival was 96 percent and minimum 53 percent 4 yr. after planting.

Effect of mineral fertilizers, peat, and compost on the growth of red pine plantations, S. A. WILDE, F. B. TRENK, and A. R. ALBERT. (Wis. Expt. Sta.). (*Jour. Forestry*, 40 (1942), No. 6, pp. 481-484, fig. 1).—Plantations of red pine 2-2

transplants grown on a depleted outwash sandy soil near Hancock, Wis., showed little benefit from various fertilizer and soil amendments and in some cases distinct injury. A broadcast application of 500 lb. per acre of a complete NPK fertilizer did increase height growth but had no effect on survival. When 1,000 lb. per acre was applied, there were a decreased survival and no well-defined effects on growth. Where materials such as peat, compost, or manure were incorporated with the soil at the time of planting, some of the treatments, particularly alkaline peat and manure, depressed growth. Strongly acid peat and compost were beneficial but the increased height growth, about 12 percent, was not adequate to justify the extra labor and costs. Ill effects are believed due to injury to the young trees by excess nutrient salts, increased weed growth, and a decrease in available water caused by organic remains of high hygroscopicity.

Exposure of roots of shortleaf pine stock, W. H. CUMMINGS (*Jour. Forestry*, 40 (1942), No. 6, pp. 490-492, fig. 1).—The roots of 1-year-old shortleaf pine seedlings were exposed for 5, 15, 45, and 135 min. beyond the minimum essential for transplanting. The day, April 24, was moderately warm and humid, with a cool, gentle breeze prevailing. With increased exposure, readings taken later on the trees showed a marked trend of reduction in the proportion of thrifty trees 2 mo. after planting, in autumn survival, and in first-season increment in height.

Effect of pregermination and radicle damage on first-year development of red oak, L. H. REINEKE. (U. S. D. A.). (*Jour. Forestry*, 40 (1942), No. 4, pp. 346-347).—Red oak acorns were planted (1) ungerminated, (2) germinated with the radicles undamaged, (3) germinated with tips of radicles removed, and (4) germinated with half of the radicle removed. Measurements on seedlings the following spring showed that removing half the radicle increased the tap root diameter significantly above that of plants with uninjured radicles. Removal of half the radicle shortened the tap roots by about 20 percent. The removal of only the tip did not affect root diameter significantly. Apparently the damage to the radicle must be rather severe before it modifies seedling development to any appreciable extent.

Response of chestnut oak reproduction to clear and partial cutting of overstory, J. G. KUENZEL and J. R. MCGUIRE. (U. S. D. A.). (*Jour. Forestry*, 40 (1942), No. 3, pp. 238-243, figs. 4).—The response of chestnut oak reproduction to release by clear cutting and by partial cutting in a second-growth stand of this species in southern Indiana was compared with behavior in an uncut stand during the 10-yr. period beginning with 1929, a year when the catch of chestnut oak seedlings was exceptionally heavy. During this period chestnut oak remained the predominant species in reproduction under all three conditions, composing more than half the total reproduction in 1939. At that time chestnut oak seedlings on the clear-cut area had made an average total height growth of 4.8 ft.; in contrast, those on the partially cut area had grown to an average height of only 0.82 ft., and those on the uncut check plat to one of only 0.48 ft. On the clear-cut area 10 yr. after cutting most of the chestnut oak reproduction was of seedling origin, but 97 percent of all the chestnut oak trees more than 1.0 in. in d. b. h. were sprouts. These sprouts had attained an average height of 21.1 ft., and only a small number of seedlings had successfully established themselves in the overstory.

The drying rate of sugar maple as affected by relative humidity and air velocity, O. W. TORGESON. (U. S. D. A. coop. Univ. Wis.). (*Jour. Forestry*, 40 (1942), No. 3, pp. 218-223, figs. 3).—Air needs were found, in general, to be proportional to drying rates and were least for the lower moisture content stock and for the slower-drying species and materials. An exception to the rule was noted

when relative humidities were increased above approximately 70 percent. Such a procedure reduces drying rate, but requires a higher air velocity to prevent excessive increases in the moisture content of the wood surface and, consequently, an excessive loss of drying time. It is suggested that the most efficient kiln from a drying standpoint would be one equipped to furnish abundant air at the beginning and lesser amounts when the moisture content of the stock decreases as reductions are made in relative humidity.

DISEASES OF PLANTS

Climate in relation to plant diseases, L. E. MELCHERS. (Kans. Expt. Sta.). (*Kans. Acad. Sci. Trans.*, 44 (1941), pp. 172-183, fig. 1).—A general discussion of the subject.

In defense of our food supply: An outline of the strategy of attack that is being devised to combat plant diseases and insect pests, D. G. FLETCHER (*Northwest. Miller*, 210 (1942), No. 2, pp. 7, 30, 31).

How plant breeding programs complicate plant disease problems, N. E. STEVENS. (Univ. Ill.). (*Science*, 95 (1942), No. 2465, pp. 313-316).—This is a general, critical discussion of the problems involved, with specific examples including wheat and hybrid corn. In addition to the two well-recognized methods by which the incidence of losses from diseases and insect pests is strongly influenced, viz, weather changes and introduction, a third, the work of plant breeders, is added. Furthermore, two closely related results of breeding programs are the introduction on a commercial scale of varieties very susceptible to certain, sometimes new, diseases and the modifying effects of new varieties on parasites long known to be commercially important. The number of potential pests is so great and the conditions so complex that no practical tests for disease resistance can cover all possible situations, so "the real test of a new variety is its culture in the hands of ten to twenty thousand farmers."

The Plant Disease Reporter, [May 1 and 15, 1942] (U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 26 (1942), Nos. 8, pp. 175-202; 9, pp. 203-225, figs. 2).—In addition to the host-parasite check-list revision, by F. Weiss (Nos. 8, *Rhodotypos* to *Rondletia*, and 9, *Rosa*), the following items are noted:

No. 8.—Notes on plant diseases in Kansas in 1941, by C. O. Johnston, including important or unusual development of diseases of cereal, forage, and fiber crops, and other diseases of minor importance or of ordinary severity in 1941 (diseases of cereal, forage, and fiber crops, legumes, grasses, trees, and miscellaneous diseases); further notes on the fungi of Nevada, by J. A. Stevenson and W. A. Archer; committee report on ring rot of potatoes in 1941, by T. P. Dykstra et al.; a defoliation of tomatoes in Indiana controlled by spraying with manganese sulfate, by H. R. Thomas; *Diitylenchus dipsaci* on *Trifolium pratense* in New York State, by R. W. Henderson; reports on the development of apple scab in western New York and the Hudson Valley, and apple scab spore discharge delayed in Maryland; and a successful spray for blue mold of tobacco, by P. J. Anderson.

No. 9.—Blueberry stunt, a virus disease, by R. B. Wilcox; a suggested basis for the prediction of wheat leaf rust epiphytotics, including tabulated data on phenological factors in wheat leaf rust development in Oklahoma, 1918 to 1941, by K. S. Chester; wheat leaf rust and other grain diseases in Oklahoma in 1942, by K. S. Chester; additional reports on diseases of small grains, including cereal rusts in Kansas, and grain diseases reported from California; white rot (*Sclerotium cepivorum*) of *Allium* in Louisiana, by E. C. Tims;

wettable Sperguson not effective as a surface disinfectant of sweetpotatoes used for seed, by H. T. Cook and L. L. Harter; and brief notes on diseases in cigar-wrapper tobacco plant beds in Florida in 1942, and pink root of shallots in Louisiana.

[Phytopathological studies by the Illinois Station] (*Illinois Sta. Rpt. 1938*, pp. 62-63, 266-267, 270-271).—Brief reports of results are given relative to adjustment of Ceresan dosages in control of wheat bunt to avoid injury to stored seed, by B. Koehler; and bordeaux still the cheapest and most dependable spray for apples where safe, sulfur fungicides satisfactory for apple scab with a minimum of injury, cherry leaf spot control by copper oxychloride, and apple measles possibly due to boron deficiency, all by H. W. Anderson.

[Phytopathological studies by the Pennsylvania Station] (*Pennsylvania Sta. Bul. 414* (1941), pp. 36-37, 39, 53, 54-55).—Brief reports of experimental results by H. J. Miller, H. W. Thurston Jr., C. C. Wernham, W. S. Beach, and S. Y. Chan include data on a three-part spray schedule for apple scab control without spray injury, and on the value of Elgetol ground sprays against this disease; a second fungus, *Typhula itoana*, causing snow mold of grasses; soil applications of CuSO_4 for controlling damping-off of tomato seedlings; and eradication of mushroom house mold by spraying, Elgetol proving particularly effective and formaldehyde, certain cresylic compounds, and burning S satisfactory for most practical purposes.

[Plant disease work by the South Dakota Station] (*South Dakota Sta. Rpt. 1941*, p. 50).—Observations on fruit diseases reported by N. E. Hansen and W. F. Buchholtz include data on varietal susceptibility of pears to fireblight, and susceptibility of sand cherry (*Prunus besseyi*) seedlings to brown rot, an undetermined leaf spot, and plum pocket.

[Studies of plant diseases by the Wisconsin Station] (*Wisconsin Sta. Bul. 455* (1942), pp. 46-47, 48-52, 62-64, 65-66, 67-68, 71-73, 75-76, figs. 7).—Brief reports by T. C. Allen, J. P. Jolivet, J. C. Walker, R. H. Larson, G. H. Rleman, W. W. Hare, W. J. Hooker, M. Stahmann, F. Smith, K. P. Link, G. W. Kelt, J. D. Moore, C. N. Clayton, B. Henry, A. J. Riker, C. A. Richards, and C. S. Moses are included on deep scab of potatoes due to a combination of the common scab and the scab 'gnat'; manganese-deficiency disease of potatoes, beans, and cabbage on burned peat soil, with Zn and Cu deficiency also possibly involved; identification of bacterial ring rot of potatoes; resistance of the Sebago potato variety to yellow dwarf; squash wilt prevalence in the State and resistance of the Table Queen variety; watermelon varieties resistant to wilt in the State; borax spray or dust for control of boron deficiency in garden beets and sugar beets; role of mustard oil in resistance to clubroot; ground sprays useful in apple scab control; sour cherry yellows a virus disease; cherry leaf spot control by low- CuSO_4 bordeaux; and oak wilt due to an undetermined fungus (coop. U. S. D. A.).

Report of Provincial plant pathologist, J. W. EASTHAM (*Brit. Columbia Dept. Agr. Ann. Rpt.*, 36 (1941), pp. 46-51).—Included are progress reports on inspection of nursery stocks for virus infections; little cherry disease, including its virus nature; spray injury to pears; wheat bunt in northern Okanagan, including varietal tests and the effects of different dates of seeding, by W. R. Foster and H. H. Evans; and *Phytophthora cactorum* dark-berry of *Cotoneaster horizontalis*.

Progress of plant pathological research in Bombay, M. N. KAMAT (*Poona Agr. Col. Mag.*, 33 (1941), No. 3, pp. 97-100).

[Phytopathological papers] (*Izv. Gruzinsk. Opytn. Sta. Zashch. Rast.*, Ser. A, *Fitopatol.* (*Bul. Georgian Expt. Sta. Plant Protect.*, Ser. A, *Phytopathol.*), No. 2 (1940), pp. 339, figs. 63).—The following are included (with briefer notes on various other plant diseases): Materials k mikroflоре tsitrusovykh kul'tur Gruz.

S. S. R. (On the Mycoflora of Citrus in the Georgian S. S. R.), by P. Ī. Nagornyi K. G. Gikashvili (Gulkashvili), and N. A. Sakvarelidze (pp. 3-40, Eng. abs. pp. 37-38); *Bolezni plodov tsitrusovykh pri khraneni i mery bor'by s nimi* (Diseases of Citrus Fruits in Storage and Their Prevention), by L. ĪA. Tsereteli and N. N. Chanturia (pp. 41-73, Eng. abs. pp. 68-68); With Reference to Disinfection of Seed and Roots of *Poncirus trifoliata* [trans. title], by L. I. Tsereteli and N. A. Okrostsvardidze (in Georgian) (pp. 74-83; Russ., Eng. abs., pp. 81-83); With Reference to the Decay of Apples in Storage in the Georgian S. S. R. [trans. title], by L. I. Tsereteli and N. N. Chanturia (in Georgian) (pp. 84-110; Russ., Eng. abs., pp. 100-107); With Reference to the Mycoflora of Ground-Nut Seed [trans. title], by V. A. Vardossanidze and E. M. Eristavi (in Georgian) (pp. 111-154; Russ., Eng. abs., pp. 136-143); With Reference to Java Black Rot of the Sweet-potato in the Georgian S. S. R. [trans. title], by L. A. Kanchaveli (in Georgian) (pp. 155-193; Russ., Eng. abs., pp. 175-193); *Materiāly k izucheniiu Sclerotium rolfsii* Sacc. *vozbuditel'ia "rizhnoi sklerofial'noi gnili"* (Contributions to the Studies of *Sclerotium rolfsii* Sacc., the Stimulus of "Southern Root Rot"), by E. M. Eristavi and S. ĪA. Isarlishvili (pp. 194-214, Eng. abs. p. 209); *Materiāly po bolezniām svekly v usloviakh Gruzinskoi S. S. R.* (Materials on the Diseases of Sugar Beets in the Conditions of the Georgian S. S. R.) (pp. 215-226, Eng. abs. pp. 224-225), and *Vyskavlenie stepeni ustoiчивosti razlichnykh sortov fasoli v otnoshenii antraknoza (Colletotrichum lindemuthianum Br. et Cav.) v usloviakh Gruzinskoi S. S. R.* (On the Degree of Susceptibility of Various Varieties of Beans to Anthracnose (*Colletotrichum lindemuthianum* Br. et Cav.) in the Georgian S. S. R.) (pp. 227-252, Eng. abs. pp. 245-247), both by S. ĪA. Isarlishvili; *Bakterioz na semenakh arakhisa* (Bacterial Diseases on the Seeds of *Arachis*), by M. L. Vachnadze (pp. 253-270, Eng. abs. pp. 267-268); *Studies on Soybean and Peanut Diseases* [trans. title] (in Georgian) (pp. 271-283; Russ., Eng. abs., pp. 278-283), and *Fungi Collected From the Crop Plants in Western Georgia and Diseases Caused by Them* [trans. title] (in Georgian) (pp. 284-298; Russ. abs., pp. 296-298), both by I. I. Shoshiashvili; and *Diseases of Sweetpotatoes in the Georgian S. S. R.* [trans. title], by E. P. Khazaradze (in Georgian) (pp. 299-324; Russ., Eng. abs., pp. 314-323).

A method of mounting cultures of fungi for preservation in the herbarium, M. B. LINN. (Cornell Univ.). (*Phytopathology*, 32 (1942), No. 6, pp. 546-547).—By the method described in detail, petri dish agar cultures are mounted on celluloid sheets cut into squares of a diameter slightly greater than that of the petri dishes. Such specimens may be examined by transmitted light under a cover slip if a drop of water or other mounting fluid is first placed thereon.

Studies on Corticium rolfsii (Sacc.) Curzi (*Sclerotium rolfsii* Sacc.).—I. Cultural characters and perfect stage; II, Mechanism of parasitism, F. L. MILTHORPE (*Linn. Soc. N. S. Wales, Proc.*, 66 (1941), pt. 1-2, pp. 65-75, pl. 1, figs. 7).—In part 1, studies of eight isolates of *S. rolfsii* indicated that the abundance and type of vegetative growth are determined largely by the nature of the medium and the temperature, and the abundance and size of the sclerotia, but not the shape and color, are also affected by these factors. Optimum growth occurred at 30° C., and decreased markedly to 15° and 37°, respectively. The hymenial stage is reported for the first time in Australia, and is referred to *C. rolfsii*. Distinct variations in the growth habit of seven monobasidiosporial cultures are also noted.

In part 2, the pathogenesis of this infection is discussed. The organism is said to penetrate the plant tissues mechanically and to give rise to coenocytic

intra- and intercellular hyphae. Killing of the cytoplasm precedes the invading hyphae by one cell layer, and dissolution of the middle lamellae occurs shortly after entry. Protopectinase and pectinase, but not pectase, are produced and are responsible for the toxic action. There are 17 references.

Elsinoë in Uganda, A. E. JENKINS and A. A. BITANCOURT. (U. S. D. A. et al.). (*Mycologia*, 34 (1942), No. 3, pp. 318-321, fig. 1).—*E. hansfordii* n. sp. is described from leaves and stems of *Scutia myrtina*.

Further notes on the witches' brooms and the substomatal pycnia of Melampsorella, S. M. PADY (*Kans. Acad. Sci. Trans.*, 44 (1941), pp. 190-201, figs. 14).—The results of this work are said to lend support to the previous observations (E. S. R., 85, p. 373) that there are two distinct species of *Melampsorella* as opposed to the monotypic conception of the genus.

A new species of Puccinia on Ocimum adscendens, M. J. THIRUMALACHAR (*Indian Acad. Sci. Proc.*, 14 (1941), No. 5, Sect. B, pp. 466-471, figs. 7).—*P. leiocarpum* n. comb. is described as the telial stage of *Aecidium leiocarpum*.

Virus nomenclature and committees, J. JOHNSON. (Univ. Wis.). (*Chron. Bot.*, 7 (1942), No. 2, pp. 65-66).—This is a report on the history of the International Committee on Virus Nomenclature and the present status of its work, and a brief general discussion of the present chaotic condition of virus nomenclature.

Serological studies on plant viruses, R. MUSHIN (*Austral. Jour. Expt. Biol. and Med. Sci.*, 20 (1942), No. 1, pp. 59-63).—Using the precipitin titration technic, positive flocculation reactions were obtained with the viruses of tomato bushy stunt, ordinary tobacco mosaic and aucuba mosaic, and with the potato viruses X, X + B, aucuba mosaic, and tuber blotch, whereas the viruses of potato spindle tuber, tomato spotted wilt, rose wilt, and strawberry crinkle gave negative results. Cross precipitin tests indicated that of these viruses only the two strains of tobacco mosaic were serologically related. Investigations of the field methods of precipitin testing showed the Chester method (E. S. R., 77, p. 792; 78, p. 493) to be reliable when the optimum antigen-antibody flocculation ratio was applied, whereas the Dunin and Popova method gave inconsistent results.

A darkening technique for inducing virus symptoms in mature as well as in growing leaves, E. M. HILDEBRAND and O. F. CURTIS. (Cornell Univ.). (*Science*, 95 (1942), No. 2467, p. 390).—Using the X disease of peach and placing the infected bud somewhere between the shaded region and the food source (in this case the unshaded leaves carrying on photosynthesis), it was demonstrated that the virus is carried into the shaded leaves along with the elaborated food material, shortening the incubation period as did pruning, defoliation, and girdling (E. S. R., 87, p. 81) and having the additional merit of inducing symptoms also on shoots and leaves that are not growing.

A virus inactivator from yeast, W. N. TAKAHASHI. (Univ. Calif.). (*Science*, 95 (1942), No. 2475, pp. 586-587).—In the work briefly reported a virus inactivator, probably a polysaccharide, was extracted from yeast by autolysis and by autoclaving. Its properties are presented, and a simple method of extracting it is described. Tobacco mosaic virus was used in the study.

New species of Acanthopage and Cochlonema destructive to soil amoebae, C. DRECHSLER. (U. S. D. A.). (*Mycologia*, 34 (1942), No. 3, pp. 274-297, figs. 6).—*A. lasiospora*, *A. gomphoclada*, *C. euryblastum*, all new species, and *C. bactrosporium longius* n. var. are described; utilization by *A. tetracerus* of the amoeba captured by *Zoopage thamnospira* is discussed; and supplementary observations are presented on *Stylopaga cephalote*.

Growing new root systems by soil banking—a promising method of rejuvenating trees attacked by root diseases, A. S. RHOADS (*Phytopathology*, 32 (1942), No. 6, pp. 529-536, figs. 3).—Following a critical discussion of present methods for treating trees attacked by root diseases, attention is called to the usefulness and practical value of a little-known natural method of inarching whereby extensively girdled trees and shrubs may be rejuvenated by soil banking, either alone or combined with previous surgical treatment, disinfection, and aeration, to stimulate development of a new root system above the partially girdled bases. Results from use of this method on citrus trees and Australian pines are described and illustrated, and its applicability to woody plants that readily develop adventitious roots is indicated. This soil-banking method offers the only known practical means of saving old seedling sweet orange trees in which the disease appears to have run its course and which have so far deteriorated that painstaking surgical work is unjustified.

Comments from the study of fungicides in 1941, J. M. HAMILTON. (N. Y. State Expt. Sta.). (*N. Y. State Hort. Soc. Proc.*, 87 (1942), pp. 41-42).

Saving spray materials for the war effort, R. H. DAINES and J. C. CAMPBELL. (*N. J. State Potato Assoc., Hints to Potato Growers*, 23 (1942), No. 1, pp. [2-4]).—Following an interpretation of "saving spray materials" as implying a choice of the best for each purpose and applying under most favorable conditions as to time and method, the authors review 3 years' tests with copper-lime dust on potatoes in which it was found that where applied at night to wet vines, with air movement at a minimum, the amounts of dust could be reduced without sacrificing foliage protection. Further savings could be made by selecting nights when dew is heaviest. Savings in sprays could also be made. For example, when applied in windy weather the coverage is poor and the spray load deposited low, and if sprayed on wet foliage the "run-off" may be excessive. Another important factor is to make sure that all equipment is properly working.

A new fungicide, D. H. PALMITER and J. M. HAMILTON. (N. Y. State Expt. Sta.). (*N. Y. State Hort. Soc. Proc.*, 87 (1942), pp. 207-209).—The most promising organic material from the 1941 fungicidal tests (briefly summarized) is said to be a fluffy black powder, ferric-dimethyldithio-carbamate, referred to as F-D-D-C, which gave apple scab control equal to that of the best dry wettable sulfurs or paste and better control of cedar-apple rust than micronized S. The new fungicide plus cottonseed oil also effectively controlled brown rot on sweet cherries.

Stimulatory and toxic effects of copper sprays on powdery mildews, C. E. YARBWOOD. (Univ. Calif.). (*Amer. Jour. Bot.*, 29 (1942), No. 2, pp. 132-135).—Conidia of *Erysiphe polygoni* germinated well on the surface of 1 percent CuSO₄, but the dried deposit of 0.1 percent bordeaux plus 0.1 percent cottonseed oil on glass slides was toxic to them in water, approximately neutral on dry slides at 100 percent relative humidity, and stimulatory on dry slides at 90 percent. Bordeaux or CuSO₄ added to sucrose agar increased the germinability and length of germ tubes. When light was inhibitory following inoculation, bean plants sprayed with 0.1 percent bordeaux frequently exhibited more mildew development on the upper surface of primary leaves than did unsprayed controls. Bordeaux was more effective as an eradicant than as a protective spray for powdery mildew on bean, and no mildew stimulation was observed when bordeaux was used as an eradicant spray.

The fungicidal and phytocidal properties of some copper xanthates, M. C. GOLDSWORTHY, R. H. CARTER, and E. L. GREEN (*Phytopathology*, 32 (1942), No. 6, pp. 497-504).—Copper xanthates prepared from methyl, ethyl, propyl, butyl, and

isoamyl alcohols were tested in the laboratory against conidia of *Sclerotinia fructicola* and *Glomerella cingulata* and copper ethyl and isoamyl xanthates in the field against *Venturia inaequalis*. In the laboratory these materials largely prevented growth of conidia of *S. fructicola* but not of *G. cingulata*. In the field, control over apple scab was less than that observed from applications of lime-S or Cu phosphate sprays. It appeared from the results of greenhouse and field tests that these materials, per se, were not phytocidal to bean or apple varieties, but that in the presence of arsenicals they promoted arsenical injury.

The fungistatic properties of pyridine carboxylic and aminobenzoic acids, a resonance effect, C. HOFFMAN, T. R. SCHWEITZER, and G. DALBY (*Jour. Amer. Pharm. Assoc.*, 31 (1942), No. 4, pp. 97-99, fig. 1).—"The demonstration that the biological activity of a molecule is related to its structural ability to exist as a resonance hybrid is of interest from many points of view. Sulfanilamide, for example, is *p*-aminobenzenesulfonamide. The isomeric meta and ortho compounds are therapeutically inactive."

Prevalence of seed-borne fungi on cereals in certain seed inspection districts of Canada, F. J. GREANEY and J. E. MACHACEK (*Sci. Agr.*, 22 (1942), No. 7, pp. 419-437).—In seed surveys and pathological tests of wheat, oats, barley, and rye seed (1939-40 crops) many species of fungi and bacteria were isolated. *Alternaria* spp. were by far the most common, but further tests indicated that, apart from the smuts, *Helminthosporium* spp. and *Fusarium* spp. were the most important disease-producing organisms. *Helminthosporium* spp. were much more prevalent in wheat and barley seed, but *Fusarium* spp. were isolated as frequently from oats seed as was *H. avenae*. Seedling blight, root rot, and certain destructive leaf spots of wheat, oats, and barley developed from seeds infected with *H. sativum*, *H. avenae*, and *H. teres*, respectively, and high correlations were found between the percentage of seed infected with the first two fungi and the amount of disease later developing. Disease surveys indicated that certain areas of Canada are much more likely than others to produce seed free, or relatively free, from such organisms. The 1940 data showed that in all districts surveyed wheat seed was comparatively free from smut spores, but a large percentage of oats and barley carried a sufficient spore load to require seed treatment. Treating seed of wheat, oats, and barley infected by *Helminthosporium* and *Fusarium* with a mercurial dust improved seed germination and gave almost complete control of seedling blight and root rot, and of leaf spot and blotch. Extensive soil tests showed that germination of clean, uninjured seed was not improved by seed treatment, but that lightly infected seed treated with an organic mercury dust was as good for sowing as was healthy seed. The results are believed to indicate that annual seed-borne disease surveys are capable of rendering valuable service to seed producers and grain growers.

The inheritance of resistance to *Ustilago nuda*, J. E. LIVINGSTON. (Nebr. Expt. Sta.). (*Phytopathology*, 32 (1942), No. 6, pp. 451-466, figs. 2).—When hybrid barley flowers were inoculated with loose smut, using the partial-vacuum method of Moore (*E. S. R.*, 75, p. 639), infection appeared to be determined by the nature of the embryo rather than by the resistance or the susceptibility of the floral tissues of the female parent on which they were borne. Penetration of the embryo by the mycelium often had a detrimental effect on the development and maturation of the seed. Failure of the method to produce 100 percent infection in the susceptible parent made analysis of the hybrids difficult, but the segregation of inoculated F₁ and F₂ progenies indicated that *Hordeum defolens* and Trebl barley each carry a single dominant factor for resistance and Mis-

souri Early Beardless may possess a weak factor for resistance. There was no evidence of linkage between factors for resistance and those for hoods or six-rowness.

Wheat rusts and wheat scald during the year 1940, T. SĂVULESCU (*Internatl. Bul. Plant Protect. [Roma]*, 15 (1941), Nos. 10, pp. 181M-185M, fig. 1; 11, pp. 201M-205M).—The observations in this communication cover the crop year 1939-40 and refer to Rumania before the territorial changes took place.

Helminthosporium spot of citronella and lemon grass in Guatemala, C. W. DONGE (*Ann. Missouri Bot. Gard.*, 29 (1942), No. 2, pp. 137-140, pl. 1).—This leaf spot of *Cymbopogon nardus* and *C. citratus* was found due to *H. cymbopogi* n. sp., which is described. Preliminary tests indicated that it may be controlled with either bordeaux or lime-S sprays.

A seed-borne mosaic of asparagus bean, *Vigna sesquipedalis*, W. C. SNYDER. (Univ. Calif.). (*Phytopathology*, 32 (1942), No. 6, pp. 518-523, figs. 2).—A mosaic of the Yardlong variety, recovered from a lot of commercial seed, is described. The causal virus was transmitted both by mechanical inoculation of expressed juice and by the pea aphid (*Macrosiphum pist*). It is also seed-borne, in this respect closely resembling the viruses of common bean, cowpea, and soybean mosaics. Thermal inactivation of the virus occurred at 55°-60° C., longevity in vitro was about 2 days, and the dilution end point was nearer 1-1,000 than 1-3,000. Inoculations to cowpea were successful, but only in certain instances were infections of common bean obtained.

Observations on a giant race of the stem celworm, *Anguillulina dipsaci*, attacking broad beans, *Vicia faba* L., T. GOODEY (*Jour. Helminthol.*, 19 (1941), No. 3-4, pp. 114-122).—The author reports having encountered giant forms of this nematode in diseased broadbean during the past few years, first in material from Portugal and later on two occasions in plants grown under ordinary field conditions in England. These forms he describes. In order to test the host range, inoculations were carried out in pot experiments (1933-34) using 16 different legumes. Of these only field pea, garden pea, soybean, and sainfoin became infested, a few lesions with slight invasion of the underlying tissues being noted. A normal-sized race of the nematode from oats is compared.

Studies on root rot of corn in Ontario, J. K. RICHARDSON (*Canad. Jour. Res.*, 20 (1942), No. 4, Sect. C, pp. 241-256, figs. 15).—"Root rot of corn in Ontario is caused primarily by parasitic soil micro-organisms, the most important of which are species of *Pythium*, *Helminthosporium*, and *Fusarium* in that order. The disease causes a decrease in the stand by pre-emergence killing and a dwarfing of the plants by the parasitic invasion and destruction of their roots by the organisms. The pathogens have different optimum soil temperatures, but the lower ranges favor those that cause the most severe damage. The roots of other field crops can be parasitized by the organisms found associated with corn root rot, but their effect on the development of the crop varies greatly. It has been proved under greenhouse conditions that the severity of the disease is greatly reduced if the corn is preceded by cover crops of soybeans and materially increased when preceded by timothy. Other crops tested have an intermediate effect." There are 23 references.

The Ulster method for the examination of flax seed for the presence of seed-borne parasites, A. E. MUSKETT and J. P. MALONE (*Ann. Appl. Biol.*, 28 (1941), No. 1, pp. 8-13, pl. 1).—The sample is thoroughly mixed and the seeds are plated out on 2 percent malt extract agar into Petri dishes, 10 seeds being spaced equidistantly in each and with a total of 100 seeds for general results but with 500 for more accurate estimation of degree of infection. The dishes are then incubated at 22° C., and after 5 days the medium around each seed is

examined for parasitic organisms. Satisfactory results have been obtained by use of this method. Examples are cited where it has been possible to determine the country or origin of flaxseed, and indications have been obtained suggesting the suitability of the method for distinguishing between new and old seeds.

Peanut leafspot and leafhopper control, L. I. MILLER (*Virginia Sta. Bul.* 338 (1942), pp. 24, figs. 7).—Leaf spots (*Cercospora* spp.) are said to be the most common and among the most destructive peanut diseases and the leafhopper (*Empoasca fabae*) one of the most injurious insect pests, the former causing substantial losses annually and the latter causing injuries only spasmodically. Experiments on the control of these two pests were conducted by the station on 70 farms in the principal peanut-producing counties of Virginia (1938-41), and the results have indicated that they can be controlled and that profitable yield increases may be obtained with 3-4 applications of finely ground S dust at 2-week intervals. The cost of dusting an acre, including rental for the duster and costs of materials and labor, is said to be about \$3. From demonstration tests (3 applications) on 30 farms, the average increase in yield of nuts was 481 lb. per acre (extremes, 238 and 834 lb.). In yields of hay, increases of 526-3,419 lb. per acre were also obtained from tests on 7 farms, the average being 1,674 lb. per acre. Nuts and hay of better quality also followed use of the S dust, and treated plants matured 5-10 days later and could be held in the ground longer without serious loss of nuts through shredding. These features proved of great advantage to growers faced with labor shortages at digging time.

Mancha preta ou cercosporiose do amendoim (*Cercospora personata* (B. & C.) Ellis) [Peanut leaf spot or cercosporiose (*C. personata*)], A. TOCCHETTO (*Rev. Agron. [Brazil]*, 5 (1941), No. 57 pp. 501-502, figs. 4).—A note on the presence of this disease and its control in Brazil.

An epiphytotic of potato blight, J. B. MARCHIONATTO (*Internatl. Bul. Plant Protect. [Roma]*, 15 (1941), No. 10, p. 181M).—Note on *Phytophthora infestans* in the eastern part of Argentina.

Experiments for control of potato late blight in an epidemic year, G. D. RUEHELE. (Fla. Expt. Sta.). (*Fla. State Hort. Soc. Proc.*, 54 (1941), pp. 106-108).—*Phytophthora infestans* blight is said to have become the most important potato disease in the Homestead (Fla.) area, though prior to 1937-38 *Alternaria solani* blight had been considered the more important. In recent tests all sprays and dusts used caused a longer duration of vine growth and significantly increased the yields of marketable tubers, but sprays were more effective for blight control than the dusts. Further details are tabulated and briefly discussed.

New blight-resistant potato varieties, K. SNELL (*Internatl. Bul. Plant Protect. [Roma]*, 15 (1941), No. 11, p. 201M).—Note on three potato varieties (Erika, Frühnudel, and Robusta) said to be resistant to *Phytophthora infestans*.

The susceptibility to leaf roll of certain potato varieties and its effect on their yield, J. B. LOUGHNANE ([*Irish Free State*] *Dept. Agr. Jour.*, 38 (1941), No. 1, pp. 48-67, pls. 3).—Following a discussion of the literature (7 references) on varietal susceptibility to leaf roll, its effects on the vigor of some of the newer potato varieties are described and those used in the 2 years' experimental work are placed in three groups on this basis. Counts (1937-38) of the prevalence of *Myzus persicae* and data on the prevalence of primary leaf roll led to the conclusion that the period when most of the latter appeared coincided with the date of maximum aphid infestation. Reduction in yield of a variety was in direct proportion to the reduction in vigor of that variety by leaf roll, and the varieties used are grouped according to the reduction in yield due to this virus disease.

Bacterial ring rot of potatoes from the standpoint of quarantine and standardization, C. H. METZGER (*Calif. Dept. Agr. Spec. Pub. 186 (1941), pp. 9-16*).—This is an address presenting a summary of current knowledge on this disease and its control, with discussions by various individuals.

Scabbia valolosa delle patate [Potato skin spot], V. BONGINI (*Bol. Lab. Sper. e R. Osserv. Fitopat. [Torino], 17 (1940), No. 1-4, pp. 25-38, pls. 2*).—It is concluded from this review and experimental study that the principal cause of the disease is *Oospora pustulans*. Secondary invaders encountered included various other fungi and nematodes. There are 19 references.

Determination of death in the larvae of the potato root eelworm, A. E. W. BORD (*Nature [London], 148 (1941), No. 3765, pp. 782-783*).—It is often exceedingly difficult to determine whether nematode larvae are dead or only dormant. It was found that staining larvae of the potato strain of *Heterodera schachtii* with a solution of 0.025 gm. of I in 100 cc. of 1 percent KI solution differentiated living from dead individuals.

O virus Y, uma das principais causas da degenerescencia das batatinhas no Estado de S. Paulo [Virus Y, one of the chief causes of potato degeneration in the State of São Paulo], K. SILBERSCHMIDT and M. KRAMER (*Biologico, 8 (1942), No. 2, pp. 39-46, pl. 1; Eng. abs., pp. 45-46*).—By passage through six tuber generations, the dissemination of this disease was verified in two experimental plats of the Elgenheimer variety—one on high and one on low land. The potato degeneration diseases in São Paulo, said to be due largely to the Y virus, were disseminated more rapidly at the low than at the high elevation. *Nicotiana glutinosa* and *N. tabacum* were used as indicator plants in the inoculation experiments, and the symptoms induced are described.

The nutrition of turnips, R. M. WOODMAN (*Ann. Appl. Biol., 28 (1941), No. 1, pp. 1-7, pl. 1*).—"The influence of variations in the supply of some inorganic nutrients on the growth of the turnip in sand was investigated. Deficiency symptoms were noted, and a statistical comparison of yields was made. Progressive diminution of available nitrogen led to a progressive diminution in yield. Similar diminution in available phosphorus led at first, in strong contrast to lettuce, to a continuous rise in yield and a less chlorotic plant, then at a relatively low concentration of phosphorus to an optimum yield, and finally to a rapid decrease in yield. Potassium deficiency gave a characteristic gray-green scorch and limpness of the foliage, together with leaf drop. The yield was not decreased greatly by a reduction of available potassium until a fairly low level was reached. Absence of boron resulted in a characteristic wastage of the foliage, and ultimately in the death of the plant; the turnips were tiny, rough-sided, and had a tendency to rot. The presence of 0.0681 p. p. m. of boron, as borax, yielded plants of normal size, health, and appearance."

Moléstias da cana da açúcar em Pernambuco [Diseases of sugarcane in Pernambuco], A. R. CAMPOS (*Bol. Sec. Agr., Indús. e Com. [Pernambuco], 8 (1941), No. 2, pp. 169-174, pls. 4*).—Considered are a root rot, and diseases due to *Leptosphaeria sacchari*, *Thielaviopsis paradoxa*, *Fumago sacchari*, *Colletotrichum falcatum*, and *Trichosphaeria sacchari*.

Tift Sudan, a utopia grass for Southeast, G. W. BURTON. (U. S. D. A. and Ga. Coastal Plain and Ga. Expt. Stas.). (*South. Seedsman, 5 (1942), No. 1, pp. 7, 31, 35, figs. 2*).—This new variety, developed by hybridizing Sudan grass strains susceptible to foliage diseases with the disease-resistant Leoti sorghum, is said to be disease-resistant, to yield twofold in hay over common Sudan grass, and to provide excellent pasturage. It contains more of the poisonous prussic acid than common Sudan grass, but in the humid Southwest where sorghums have been grazed there is little likelihood of livestock poisoning from grazing Tift Sudan. Limited seedstocks are said to be available.

Certain enzymatic activities of normal and mosaic infected tobacco plants, F. L. WYND. (Univ. Ill.). (*Jour. Gen. Physiol.*, 25 (1942), No. 4; pp. 649-661, figs. 3).—Leaves of mosaic-inoculated tobacco plants exhibited a great decrease relative to normal tissue in oxygenase and peroxidase activities on the sixth day, though younger leaves showed this minimum at a progressively later date; and great increases were attained at 14-18 days, followed by a second decrease. Catalase exhibited increased activity, reaching a maximum about the eighth day, with a second one at 16-18 days. Invertase reached a minimum relative to controls about the eighth day, with a second one approached at 16-18 days. These data indicate profound physiological disturbances in infected plants many days before the leaf juice attains an infectious virus concentration. It is suggested that these activities could hardly be due to metabolic activities of the virus particles themselves. Since infectivity is attained only after a period of profound physiological disturbance, it is believed possible that the virus protein develops as a product of abnormal metabolism. There are 25 references.

Control of seedling diseases of sugar beets in Montana, M. M. AFANASIEV and H. E. MORRIS. (Mont. Expt. Sta.). (*Phytopathology*, 32 (1942), No. 6, pp. 477-486, figs. 2).—Seed treatments alone proved only slightly beneficial for controlling the seedling diseases of sugar beets due chiefly to *Phoma betae*, *Pythium* spp. and other soil-borne Phycomycetes, and *Rhizoctonia* spp., but soil treatments, regardless of seed treatments, proved highly important. Plots with the most complete soil treatments, viz, NPM, N/2 P, N/2 P, NPM+Ca(OH)₂, and NP+Ca(OH)₂ (N=nitrates, P=phosphates, and M=manure, and N/2 and N/3 mean nitrates applied in two and three applications, respectively), produced the minimum of seedling disease and the highest yields and stands. Plots treated with NP, N/3 P, and MP had fairly good yields and stands, but also considerable amounts of seedling diseases. The plots with unbalanced soil amendments (N, P, and M) all exhibited a high amount of seedling disease, and the yields and stands also were poor except where treated with manure. Control plots and those treated only with Ca(OH)₂ had the highest amounts of seedling diseases and the poorest yields and stands. It is concluded that seedling diseases of sugar beets in heavy irrigated Montana soils can be efficiently controlled with concomitant good stands and high yields by creating conditions conducive to rapid and healthful development of young sugar beets through sufficient and balanced fertilization and improvement of the physical condition of the soil.

Sorghastrum, host of an undescribed smut, A. B. MASSEY and G. L. ZUNDEL. (Va. A. and M. Col. and Pa. State Col.). (*Phytopathology*, 32 (1942), No. 6, pp. 544-546).—A high incidence of head smut found on a small colony of *S. elliotti* near Chatham, Va., proved to be an undescribed species of *Sphacelotheca*, here described and named *S. sorghastri*. The host is said not to have been previously reported in Virginia outside of the Coastal Plain, this station extending its range 125 miles into the Piedmont. *Sorghastrum nutans* is common over the State.

The mechanism of spore dispersal in Peronospora tabacina and certain other downy mildew fungi, J. A. PINCKARD. (Va. Expt. Sta.). (*Phytopathology*, 32 (1942), No. 6, pp. 505-511, figs. 2).—Sporangial dispersal, caused by changes in moisture content of the air, are described for *P. tabacina*, *P. parastictica*, *P. geranii*, *P. halstedii*, and *P. effusa*. Freshly formed sporangioophores bearing sporangia of *P. tabacina*, when examined in air and under conditions of changing water vapor pressure, exhibit violent hygroscopic movement and sporangial discharge. If no water vapor deficit exists, no movement occurs and the sporangia

proliferate in place. The mechanics of sporangial discharge may be described as either the result of entanglement of sporangiophore branchlets and/or the ejection of sporangia by hygroscopic forces applied at the base of the sporangia when a water-vapor pressure deficit exists. Since several other members of the genus *Peronospora* were observed to react similarly, it appears that this mechanism has a definite function in the life history of these organisms and that it serves to disperse the sporangia during the most favorable period for sporangial dissemination and germination. Sporangial dispersal among the Peronosporales does not, as was commonly believed, depend on the mechanical action of wind and rain, but on water vapor pressure deficit at maturity.

Cold injury of flue-cured tobacco seedlings, J. A. PINCKARD and L. S. BOZOVANSKY. (Va. and Miss. Expt. Stas.). (*Phytopathology*, 32 (1942), No. 6, pp. 512-517, figs. 4).—Incipient cold injury to seedlings of both the burley and flue-cured types of tobacco resulted in bleaching of the bud leaves. Common in early spring, it appears to be induced by 2-3 hours' exposure at 24°-26°F., or 15-16 hours' exposure at 29°-32°. Typical symptoms of the so-called "white bud" disease, a phase of cold injury, appeared 4-5 days after exposure to these temperatures. The first tissues in tobacco leaves to succumb were those at the margins of very young leaves, which appeared true for both seedlings and older plants. More intense cold destroyed the apical meristem in both young and old plants, but cold injury to mature leaves resulted in irregular patterns and blanching.

Boron nutrition of cauliflower in relation to browning, C. H. DEARBORN ([New York] *Cornell Sta. Bul.* 778 (1942), pp. 29, figs. 16).—A survey (fall of 1934) of about 150 farms in the Catskill Mountain area covering 443 acres of cauliflower revealed about 30 percent unfit for marketing because of browning of the heads. No clue as to the cause being found, field experiments (coop. Delaware County Farm Bureau) were started in 1935 and continued through 1939, along with greenhouse tests on soil from affected fields and on culture solutions, and with histological and microchemical studies. The various symptoms described include a bitter flavor both in the raw and cooked state, even in the absence of browning. Preliminary tests with six minor elements indicated that where borax had been mixed with the fertilizer and broadcast or applied in trenches near the rows, surface browning was satisfactorily prevented. Further studies confirmed these results, and all the B-deficiency symptoms developing in the greenhouse were identical with those observed in the field. Furthermore, the yield data for weight of head showed that plants supplied with borax, at any rate used, produced heads significantly larger than those without borax. In a greenhouse test whole plants without and with borax (at 10 lb. per acre) contained nearly the same amount of dry matter, but their fresh weight differed by 14.5 percent and that of the heads alone by about 44 percent in favor of the treatment. When the dry weight of the heads was expressed as percentage of their fresh weight it was seen that there was a higher proportion of dry matter in the heads of B-deficient than of normal plants, indicating that an abundant supply of carbohydrates was translocated to such heads.

Differences of opinion are noted as to where B deficiency is first manifested in green plants, but in this study they were first observed in the parenchyma cells of the pith and the cortex of the stem. Microchemical tests for reducing sugars in the root and head of both B-deficient and normal plants revealed that in all cases the amounts of Cu reduced in the B-deficient roots and heads were far in excess of those reduced in the tissues of normal plants. There is believed little reason to doubt that in advanced stages of B deficiency disorganization within the conducting system has occurred, but the fact that sugars are abundant when the intercellular spaces are being filled with the translucent mucilaginous

substance is considered evidence that the supply of energy materials is not exhausted in these areas. Further details of the work are presented, and comparisons with results of investigations on B deficiencies by others are given.

La "viruela" del apio en la provincia de Mendoza [Celery late blight in Mendoza Province], R. E. PONTIS (*Bol. Agr. [Argentina]*, 9 (1941), No. 1-3, pp. 54-56, fig. 1).—This is a note on *Septoria apii graveolentis* in Argentina.

Mosaic of celery caused by the virus of alfalfa mosaic, W. C. SNYDER and S. RICH. (Univ. Calif.). (*Phytopathology*, 32 (1942), No. 6, pp. 537-539, fig. 1).—Celery mosaic, consisting of a mild to conspicuous yellow-green mottle, was induced in greenhouse tests by mechanical inoculations of the Golden Self Blanching variety with extracted juice from plants infected with the alfalfa mosaic virus. Four California sources were used, with properties determined as follows: Temperature inactivation point, 60°-65° C.; dilution end point, 1-2,000 to 1-3,000; and longevity in vitro, 3-5 days. Transmission by the pea aphid (*Illinoia pisi*) was demonstrated. A direct relationship in the field between alfalfa mosaic and this caliclike mosaic of celery is suggested.

Structure and germination of *Septoria* spores, H. G. MACMILLAN and O. A. PLUNKETT. (U. S. D. A. and Univ. Calif.). (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 10, pp. 547-559, pls. 2).—The authors studied and report in detail on the spore structure, growth, and germination in *S. apii-graveolentis* from cultivated and escaped celery, and the meaning and significance of terms applied to the spores, such as "septation," "guttula," and "maturity," are analyzed. Assuming that the spores of this species reveal the nature of *Septoria* spores in general, the existent inadequacy and confusion in the descriptions of species in the genus are discussed, and suggestions are offered for greater precision in observation and description. It is concluded that *S. apii-graveolentis* spores are mature when they consist of four cells (3-septate). Septation in the spores is caused by the abutting membranes of contiguous cells within the integument, and there is no wall or true septum within the mature spore. The guttulae of *Septoria* spores in descriptive mycological literature are bright spots produced by lens action on the clear portions within the cells. Germination is accompanied by cell proliferation, usually by division of the end cells of the spore. Changes in the appearance of the cell contents occur with progressive stages of germination. There are 16 references.

Celery spraying experiments at the Everglades Experiment Station, G. R. TOWNSEND. (Fla. Expt. Sta.). (*Fla. State Hort. Soc. Proc.*, 54 (1941), pp. 130-131).—In tests conducted since 1930 bordeaux is said to have proved equal or superior to all the insoluble coppers and several Cu-lime dust mixtures. Some of the so-called bordeaux injury was found due to excess lime, and a 4-2-50 formula is thus recommended.

The perfect stage of *Phomopsis vexans*, L. O. GRATZ. (Fla. Expt. Sta.). (*Phytopathology*, 32 (1942), No. 6, pp. 540-542, figs. 2).—Comparative study of numerous isolates of *P. vexans*, cause of "tip-over" disease of eggplants, yielded several which produced typical perithecia, asci, and ascospores in culture. These isolates were pathogenic for eggplants. The perfect stage not having been previously described, the binomial *Diaporthe vexans* n. comb. is proposed for it.

Influence of temperature on the expression of big-vein symptoms in lettuce, R. C. THOMPSON and S. P. DOOLITTLE. (U. S. D. A.). (*Phytopathology*, 32 (1942), No. 6, pp. 542-544, fig. 1).—Symptom expression was found to be almost if not entirely masked by high temperature (day, 85°-75° F.; night, 50°-60°). Typical symptoms appeared at temperatures of 50°-60° by day and 45°-50° by night. Leaves both with typical symptoms and with no evidence of the disease were produced on the same plants by alternate periods of high and

low temperature. Changes in temperature appeared to have no effect on the presence or absence of the symptoms after the leaves had completed their grand period of growth.

Should chemically treated pea seed be inoculated? G. L. McNEW and A. W. HOFER. (N. Y. State Expt. Sta.). (*Canner*, 94 (1942), No. 19, pp. 11-12, 24, fig. 1).—"The ordinary copper and mercury treatments for pea seed are so toxic to bacteria that they prevent successful inoculation with nodule bacteria. Seed treated with Spergon was successfully inoculated in repeated tests in the greenhouse, but the results have not yet been confirmed by field observation. Even Spergon injures the bacteria, so only strong, viable cultures should be used, and these should be applied immediately before planting to seed treated with not more than 1.5 oz. of chemical per bushel."

Un marciume dei frutti del peperone da "Botrytis" tipo "vulgaris" Fr. [A rot of pepper fruit due to a *Botrytis vulgaris*-type fungus], G. OSSINI (*Bol. Lab. Sper. e. R. Osserv. Fitopat.* [Torino], 17 (1940), No. 1-4, pp. 52-61, pl. 1; *Ger. abs.*, p. 61).—The fruit rot of *Capsicum annuum* here studied is shown to be due to a *Botrytis* with sclerotial stage.

Virus diseases of tomato, P. E. M. CLINCH ([*Irish Free State*] *Dept. Agr. Jour.*, 38 (1941), No. 1, pp. 24-47, pls. 7).—Descriptions are given of common tomato mosaic, single-virus streak, aucuba mosaic, enation mosaic, double-virus streak, and spotted wilt, and the relationships of the underlying viruses are indicated and their properties and modes of transmission presented. There are 30 references.

"Dunking" tomatoes for their health, G. B. REYNARD. (U. S. D. A.). (*South. Seedsman*, 5 (1942), No. 1, pp. 10, 30, figs. 5).—The author describes a method successfully used to test the resistance of seedling tomato plants to gray leaf spot (*Stemphylium*) and early blight (*Alternaria*) which on a few yards of greenhouse bench in winter tests supplements acres of summer trials. Liquid cultures of the fungi are thoroughly mixed in an electric stirrer until broken into fine particles, when the potted seedlings are dipped therein, thus covering both leaves and stems with thousands of particles of the fungi. After 2 days in a moist chamber the plants are then placed on greenhouse benches for observation. Field use of this technic was found to give comparable results, enabling the rapid discovery of resistant seedlings and elimination of susceptible ones in the breeding and selection program.

The development of wilt resistant tomatoes, C. M. TUCKER. (Univ. Mo.) (*Missouri Acad. Sci. Proc.*, 7 (1942), No. 4, pp. 90-91).—An abstract.

On the occurrence of the chrysanthemum eelworm, *Aphelenchoides ritze-ma-bosi*, in a tomato fruit, T. GOODEY and S. H. BENNETT (*Jour. Helminthol.*, 19 (1941), No. 3-4, pp. 123-126).—This is a brief note on the occurrence of this nematode within the tissues of tomato fruits. Though well known as a leaf parasite, it is believed not to have been previously reported from a fruit.

Injury to tomato seed in disinfection, J. H. MILLER and R. Grogan. (Univ. Ga.). (*Phytopathology*, 32 (1942), No. 6, pp. 524-528, figs. 2).—The tests reported indicate that when the ratio between amount of seed and volume of treating solution is increased above 1:8 germination is progressively impaired. The curves for Ceresan and HgCl₂ were not significantly separated in one test and in a second the trends were reversed, so one cannot logically predict a difference in germination depression between the two from the results of this study. Both of them, however, showed the downward trend of the curves in wide ratios. The ratio of 1:8 produced complete disinfection without a too-serious drop in germination.

Fruit diseases in 1941, W. D. MILLS. (Cornell Univ.). (*N. Y. State Hort. Soc. Proc.*, 87 (1942), pp. 8-15).—A brief seasonal survey of diseases of pome, stone, and small fruits for New York State.

Apple scab development, H. W. ANDERSON (*Ill. Hort.*, 31 (1942), No. 2, p. [1]).—Perithecia with mature ascospores are recorded for February 5, 1942, said to be the earliest record for Illinois.

Prebloom sprays for apple scab control, H. W. ANDERSON (*Ill. Hort.*, 31 (1942), No. 2, pp. [1-2]).—The value of two prebloom sprays is stressed, and from the standpoint of economy and efficiency a 1-50 lime-S is recommended for the prepink application, with a microfine S such as a flotation paste for the pink spray.

Ground sprays as supplementary scab control measure, A. B. GROVES. (Va. Expt. Sta.). (*Va. Fruit*, 30 (1942), No. 4, pp. 13-14).—A general discussion and evaluation of ground sprays for apple scab control.

Is there danger of reducing the set of fruit by blossom-time sprays or dusts for control of scab, rust, or fire-blight? **F. H. LEWIS.** (Cornell Univ.). (*N. Y. State Hort. Soc. Proc.*, 87 (1942), pp. 15-24).—The experimental data (1939-41) presented are believed to leave little doubt that spraying or dusting in bloom with the materials used (S dust and spray, dilute lime-S, flotation S, bordeaux spray, Thylox flotation paste, lime-hydrated spray lime, and Cu-lime dust) will reduce the fruit set in many cases and may have an effect on fruit size. Lime-S appeared to cause the greatest reduction in set. Various minor or exceptional effects are discussed, and it is concluded that from present knowledge the individual grower should balance the danger of greater loss from fruit diseases if a bloom application is omitted against the possible reduction in fruit set (in some cases beneficial) and the risk of russetting.

Some factors affecting apple scald disease, R. M. SMOCK and F. W. SOUTHWICK. (Cornell Univ.). (*Science*, 95 (1942), No. 2475, pp. 576-577).—Two years' results on the Rhode Island Greening variety are reported to indicate that coating the fruit with a wax emulsion (Brytene 489 AM) gives considerable promise in scald control. Progress has also been made in "air conditioning" the storage atmosphere to rid it of the harmful volatiles responsible for scald.

Experiments with arsenite sprays to eradicate *Sclerotinia laxa* in stone-fruit trees as a means of controlling the brown rot disease in blossoms, E. E. WILSON. (Calif. Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 64 (1942), No. 10, pp. 561-594, figs. 6).—A serious blossom blight due to this fungus is reported as common on several stone-fruit species in California. On entering the blossoms it proceeds to invade the twigs, thus destroying much of the fruiting wood. Since the only known hold-over stage of the fungus occurs on the tree, an opportunity was given to test the possibility of reducing the survival level by eradicant fungicides. In experiments over a 3-yr. period involving about 161 separate trials in 15 counties and under great variations in temperature and rainfall, dormant spraying of brown rot-infected apricot, almond, prune, and plum trees with aqueous suspensions of monocalcium arsenite was found to prevent development of an extremely high percentage of the sporodochia—source of the conidia causing blossom infection in the spring—because soluble As from the spray film penetrated the hold-over twigs sufficiently to kill most of the mycelium bearing them. The Na and Zn arsenites used were erratic in their effect on the fungus. The Ca salt also proved capable of destroying sporodochia present when the spray was applied. Marked decreases in blossom infection attended high degrees of sporodochial suppression. The concentration of the arsenite in the spray and timing of applications with respect to efficacy against the fungus and injury to the tree are discussed in detail. Almonds proved very sus-

ceptible to arsenite injury, whereas the apricot and plum varieties tested were much less so.

Brown rot of peach and its control, R. H. DAINES (*New Jersey Stat. Agr. Expt. Sta. Rep.*, 1942, pp. 8, figs. 3).—This is an informational circular embodying the essentials of present knowledge on the disease and its control.

How to prevent destruction of New York State peach orchards by the new yellow-red virus disease, E. M. HILDEBRAND and D. H. PALMITER. (Cornell Univ. and N. Y. State Expt. Sta.). (*N. Y. State Hort. Soc. Proc.*, 87 (1942), pp. 34-40).—This is a general review of present knowledge on this virus disease, with the final advice to buy trees from reliable nurseries, isolate young plantings a minimum of 500 ft. from chokecherries, and destroy all chokecherries within 500 ft. of bearing peach orchards.

Crystalline versus monohydrated zinc sulphate as a preventive against arsenical injury on peaches, R. H. HURT (*Va. State Hort. Soc. Rpt.*, 46 (1941), pp. 48-51).—This is a note summarizing several years' tests with $ZnSO_4$ and lime, with formulas, for control of arsenical injury. Experimental tests and commercial use indicated that there is very little difference between the results with crystalline v. the monohydrated Zn salt.

Cranberry disease control in war time, R. B. WILCOX. (U. S. D. A.) (*Amer. Cranberry Growers' Assoc., Proc. Ann. Mtg.*, 72 (1942), pp. 19-22).—This is a general discussion, with suggestions especially pertinent to the wartime situation.

Studies in strawberry virus diseases, IV, V (*Jour. Pomol. and Hort. Sci.*, 19 (1942), No. 3-4, pp. 212-242, pls. 2, figs. 4).—This is a continuation of previous studies.¹

IV. Symptom expression of yellow-edge in the variety Royal Sovereign, M. E. KING and R. V. HARRIS (pp. 212-226).—The symptom expression of yellow-edge is said to be closely correlated with the interaction of temperature and soil moisture, with three phases: (1) In early spring the soil moisture is adequate but the temperature is not high enough for symptom expression. (2) An intermediate phase begins with the minimum air temperature at about 60° F. at a time the soil moisture is often too low for symptom development, and this accounts for the occasional and merely temporary appearance of symptoms during May and June. (3) The final phase supervenes as the temperature falls in late summer and autumn, when, although the soil may be saturated, the symptoms gradually fade away as the weather becomes colder. Experiments have shown that there is no simple nutritional explanation for the difference in intensity of symptoms among individual plants. In a field test, the results suggested that a mixture of virus strains might have been present but that no resistance was exhibited by mildly affected plants towards infection with the more virulent strains. The first result of yellow-edge infection is a flattening of the plants, followed later by reduction in size, these manifestations increasing with intensity of symptoms. Affected plants also show considerable reduction in development of runners. The symptoms begin to show 1-2 weeks after environmental conditions are such that air temperature is above 60° and soil moisture is plentiful. These periods, when symptoms are most easily detected and when roguing should be done, usually occur in England in June, and, especially, in September and October.

V. The use of *Fragaria vesca* L. as an indicator of yellow-edge and crinkle, R. V. HARRIS and M. E. KING (pp. 227-242).—The method of inarching stolons with stolons or with leaf petioles was used to determine the virus content of selected stocks of a number of strawberry varieties by inarching to healthy indicator plants. Of several possible indicators tried, *F. vesca* proved the most satisfactory. Certain selections of the susceptible Royal Sovereign, Sir Joseph

¹ East Malling [Kent] Res. Sta. Ann. Rpt., 24 (1936), pp. 212-221, pls. 3, fig. 1.

Paxton, and King George were found to induce no visible reaction in *F. vesca* and were thus considered virus-free. Selections of certain varieties exhibiting no symptoms of infection themselves transmitted disease when grafted to *F. vesca*, in which symptoms developed. Nearly all the selections of such carrier varieties induced symptoms in *F. vesca* and were, therefore, not virus-free, but one strain of Huxley Giant appeared to be free from viruses and is being propagated for further trials. Negative results were obtained as to seed transmission.

The influence of the root on chlorosis of the Concord grape, F. B. WANN and A. WILSON. (Utah State Agr. Col.). (*Utah Acad. Sci., Arts, and Letters, Proc.*, 17 (1939-40), p. 2).—An abstract.

Notes on Clitocybe root rot of bananas and other plants in Florida, A. S. RHOADS. (Fla. Expt. Sta.). (*Phytopathology*, 32 (1942), No. 6, pp. 487-496, figs. 3).—This toadstool root rot, due to *C. tabescens*, which has been found to be widespread in occurrence throughout Florida and frequently very destructive to a large variety of native, fruit, and ornamental trees, and shrubs and vines, is reported. The symptoms, described and illustrated, agree closely with those of a corm rot of bananas (attributed to *Clitocybe* sp.) reported as increasingly prevalent in New South Wales where plantings are extended to newly cleared hardwood forest land. Notes are also included on the widespread loss of a number of trees and other plants, mostly exotic and including a number of uncommon subtropical ones, from attack by *C. tabescens* in the same area where this disease proved so destructive to bananas.

Color handbook of citrus diseases, L. J. KLOTZ and H. S. FAWCETT (*Berkeley: Univ. Calif. Press*, 1941, pp. [3]+90, pls. 40).—"The purpose of this handbook is to provide citrus growers, packing-house men, horticultural inspectors, and extension workers with a ready means of identifying the various diseases that attack citrus, by describing and illustrating their effects, and to give essential information on their control."

Phomopsis sp. coleccionado sobre plantas citricas em Piracicaba e Guarujá [Phomopsis sp. collected on citrus plants in Piracicaba and Guarujá], R. AVERNA SACCÁ (*Rev. Agr. [Brazil]*, 16 (1941), No. 9-10, pp. 455-460, figs. 4).—The author reports studies of a *Phomopsis* found on *Citrus* spp. not identifiable by him with any previously named species on these hosts, together with a brief note on a sterile mycelium found on orange fruit.

A leprose da laranjeira [Citrus leprosis], A. TOCCHETTO (*Rev. Agron. [Brazil]*, 5 (1941), No. 59, pp. 663-664, figs. 3).—A note on this insect-transmitted virus disease and its control in Brazil.

La lucha contra *Sphaceloma australis*, parásito del mandarino en la Provincia de Santa Fe [Control of *S. australis*, parasite of mandarin oranges in Santa Fé Province, Argentina], E. SCHIEL (*Rev. Argentina Agron.*, 9 (1942), No. 1, pp. 19-27; *Eng. abs.*, p. 27).—From the trials reported, it is concluded that two bordeaux sprays, the first just before blooming and the second when at least three-fourths of the petals have fallen, will be effective for commercial control.

A review of our knowledge of [citrus] melanose and its control, R. S. EDSALL (*Fla. State Hort. Soc. Proc.*, 54 (1941), pp. 26-33, figs. 2).

The hare and the tortoise of citrus stem-end rot; the comparative behavior of *Diplodia* and *Phomopsis*, C. BROOKS. (U. S. D. A.). (*Fla. State Hort. Soc. Proc.*, 54 (1941), pp. 61-63).—Studying stem-end rot, from the standpoints of both grower and consumer one of the most serious diseases of Florida citrus fruits and caused by either *D. natalensis* or *P. citri*, numerous inoculations indicated that the former at 75° F. works about twice as fast as the latter. However, culture tests showed that in commercial operations *Phomopsis* is the

more important cause of decay in oranges that have not passed through the coloring room, whereas *Diplodia* causes nearly all that on fruit receiving the ethylene treatment. The reason was found to be that ethylene gas stimulates the thick-walled *Diplodia* spores to germination. Borax is generally recognized as the best fungicide for controlling stem-end rot, but tests showed that it must be applied previous to the coloring room treatment to be fully effective. Other fungicides used, such as Na phenyl-phenate, have given promise but need further trials.

A Laschia on cabbage palmetto, V. K. CHARLES (U. S. D. A.). (*Mycologia*, 34 (1942), No. 3, pp. 235-240, fig. 1).—*L. sabalensis* n. sp. is described from dead leaves of *Sabal palmetto*.

Observations on the life history of Anguillulina pratensis, C. H. GADD and C. A. LOOS (Ann. Appl. Biol., 28 (1941), No. 1, pp. 39-51, figs. 4).—Measurements of this nematode collected from tea cortex and soils are summarized. Attempts to maintain it in vitro were unsuccessful. A rapid method for determining the nematode content of roots is described, and its value in studying the life cycle of this form is demonstrated. The females average 1.6 eggs per day for a period rarely exceeding 5 weeks. The eggs hatch in 15-17 days, the adult stage is reached in 15-16 days, and the females begin to lay about 15 days later. In the absence of males, egg-laying is usually delayed.

Science and roses, L. M. MASSEY. (Cornell Univ.) (Amer. Rose Ann., 1942, pp. 61-67).—A brief review of past research on roses and on their diseases and pests, initiated on the appearance of the new American Rose Annual Cumulative Index.

Continued rose research at Cornell, R. C. ALLEN. (Cornell Univ.). (Amer. Rose Ann., 1942, pp. 99-101).—This is a progress report on studies having particular reference to winter injury of roses, its causes and protection against it.

White pine blister rust control—Michigan.—Annual Report, 1941, J. K. KROEBER ([Lansing]: Mich. Dept. Agr. 1941, pp. [6]+34, figs. 2).—See previous reports (E. S. R., 85, p. 498).

Decay of western hemlock in western Oregon and Washington, G. H. ENGLEBETH. (U. S. D. A.). (Yale Univ. School Forestry Bul. 50 (1942), pp. [4]+53, pls. 6, figs. 3).—Western hemlock (*Tsuga heterophylla*) is said to be one of the most important forest trees in the Pacific Northwest, where it attains its maximum development. In cruising and marking for cutting, forest officers often encounter decays which are not typical of the brown stringy rot due to *Echinodontium tinctorium*, which has generally been considered ubiquitous on this species. Because of this observation the present study was initiated and carried out (1935-40), involving the dissection and analysis of 801 trees for decay. *Fomes annosus* root rot was found responsible for 21 percent of the board-foot volume decayed, *F. pini* conk rot for 19.2, *F. applanatus* white mottled rot for 17.1, *F. hartigii* white trunk rot for 10.1, *Ganoderma oregonense* white spongy rot for 7.2, *F. pinicola* brown crumbly rot for 6.7, *E. tinctorium* brown stringy rot for 5.3, *Poria colorea* n. sp. spongy butt rot for 4.3, *Armillaria mellea* shoestring-fungus rot for 3.7, *Polyporus sulphureus* brown cubical rot for 2.3, *P. officinalis* brown trunk rot for 1.5, *P. schweinitzii* red-brown butt rot for 0.9, and *Polystiotes abietinus* pitted sap rot, *F. subroseus* yellow-brown top rot, and *Poria subacida* feather rot each for 0.1 percent.

The various infection courts for decay in this tree were knots, falling-tree scars, roots, mistletoe burls and knots, broken tops, fire scars, lightning scars, and frost cracks. Though more infections occurred through falling-tree scars than otherwise, those through mistletoe knots accounted for the greatest amount of decay. Ordinary knots ranked third in number of infections and second in

percentage of total decay. Infection through mistletoe burls and swollen limbs adjacent to the trunk accounted for 30.9 percent of the decay volume in board-feet. In general, western hemlocks were frequently infected at 60–85 yr. of age, and decay became extensive at about 200 yr. Conk rot and white trunk rot were most frequent on the Cascade areas, but *Fomes* root and white mottled rots were more common on the coast areas. Brown stringy rot was limited to trees of poor vigor at high elevations and on poor sites, and the injury from this cause was negligible in the commercial stands in western Oregon and Washington. There are 40 references.

Effect of addition of sugar on rate of decay of wood, W. P. K. FINDLAY (*Ann. Appl. Biol.*, 28 (1941), No. 1, pp. 19–22).—No significant difference was found in the amount of decay of beech and pine by various fungi between samples of wood treated with 0.5–1 percent solutions of sucrose or with 1 percent dextrose, and controls treated with water. The loss in weight of samples treated with 5 percent sucrose or 2.5 percent dextrose was less than that of the controls, but with allowance for the full weight of the sugar added the total loss was slightly greater than that of the controls. It is believed that a large proportion of such loss is due to destruction of the sugar and that the destruction of wood substance is less in the presence of large amounts of readily available sugars, which are utilized by the fungus in preference to the more refractory polysaccharides in the wood.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Catalog of the type specimens of mammals in the United States National Museum, including the Biological Surveys collection, A. J. POOLE and V. S. SOHANTZ (*U. S. Natl. Mus. Bul.* 178 (1942), pp. XIII+705).—Included in this second catalog (*E. S. R.*, 20, p. 1144) are a geographical guide to type localities (pp. 577–640), a list of collectors of the type specimens of mammals in the United States National Museum, including the Biological Survey's collection (pp. 641–646), and an index to generic, specific, and subspecific names (pp. 647–705).

On the analysis of productivity in populations of higher vertebrates, P. L. EBRINGTON. (Iowa Expt. Sta. et al.). (*Jour. Wildlife Mangt.*, 6 (1942), No. 2, pp. 165–181).

Insect feeding by the house mouse [*Mus musculus*], J. P. LINDUSKA (*Jour. Mammal.*, 23 (1942), No. 2, pp. 212–213).

Ecology of the opossum [*Didelphis virginiana*] in eastern Texas, D. W. LAY (*Jour. Mammal.*, 23 (1942), No. 2, pp. 147–159, figs. 3).

Cottontail rabbit nests and nestlings, J. D. BEULE and A. T. STUDHOLME. (Pa. Expt. Sta. et al.). (*Jour. Wildlife Mangt.*, 6 (1942), No. 2, pp. 133–140, pl. 1).

Using baits in rat control, E. M. MILLS (*Pests*, 10 (1942), No. 5, pp. 6–7, 28).

The fortification of red squill [*Urginea maritima*] by means of an extract of red squill, D. G. CRABTREE, J. C. WARD, and F. E. GARLOUGH (*Jour. Amer. Pharm. Assoc.*, 31 (1942), No. 5, pp. 142–144, figs. 2).—Account is given of an efficient method that has been developed for the fortification of red squill powder, using the counter-current principle of extraction. In this way it is possible to increase the potency of weak red squill powder to the point where it can be used efficiently in rat-control operations. Fortified red squill contains all of the safety factors inherent in red squill powder, and the solvent is recovered and used again in the process. This method may easily be adapted to large or small scale operations.

An ecological study of winter dens, with special reference to the eastern skunk, D. L. ALLEN and W. W. SHAPTON (*Ecology*, 23 (1942), No. 1, pp. 59-68, figs. 3).

Some major factors affecting the use of two inventory methods applicable to the western fox squirrel (*Sciurus niger rufiventer* (Geoffroy)), E. A. HICKS. (Iowa Expt. Sta. et al.). (*Iowa State Col. Jour. Sci.*, 16 (1942), No. 2, pp. 299-305).

A note on squirrel damage to conifers, R. E. BALCH (*Forestry Chron.*, 18 (1942), No. 1, p. 42).—A brief reference is made to the damage of conifers caused by the red squirrel cutting off shoot buds from late summer to spring. The squirrel supplements its winter diet of hoarded material with buds of various trees, the balsam and fir flower buds being preferred in the Maritime Provinces of Canada.

Adaptive modifications for tree-trunk foraging in birds, F. RICHARDSON (*Calif. Univ. Pubs. Zool.*, 46 (1942), No. 4, pp. [3]+317-368, pls. 2, figs. 16).

Life histories of North American flycatchers, larks, swallows, and their allies: Order Passeriformes, A. C. BENT (*U. S. Natl. Mus. Bul.* 179 (1942), pp. XI+555, pls. 70).—This fourteenth of the series of bulletins on the life histories of North American birds (E. S. R., 84, p. 73) is based upon the same general plan and the same sources of information.

Bobwhite foods and conservation farming, V. E. DAVISON. (U. S. D. A.). (*Jour. Wildlife Mangt.*, 6 (1942), No. 2, pp. 97-109, fig. 1).—This contribution includes 10 references to the literature cited.

Seasonal food preference trends of eastern ruffed grouse [*Bonasa umbellus umbellus*] in Iowa as shown by dropping analysis, E. B. POLDERBOER. (Iowa Expt. Sta. et al.). (*Iowa State Col. Jour. Sci.*, 16 (1942), No. 3, pp. 331-335).

Income possibilities from a small artificial pond in eastern Connecticut, A. E. MOSS. (Univ. Conn.). (*Jour. Wildlife Mangt.*, 6 (1942), No. 2, pp. 141-146).

Trout management studies at Great Smoky Mountains National Park, W. KING (*Jour. Wildlife Mangt.*, 6 (1942), No. 2, pp. 147-161, pls. 4).

How to collect and preserve insects, H. H. ROSS (*Ill. Nat. Hist. Survey Cir.* 39 (1941), pp. [4]+48, figs. 54).

Collecting and preserving immature insects, A. C. COLE. (Univ. Tenn.). (*Jour. Tenn. Acad. Sci.*, 17 (1942), No. 2, pp. 166-172).—Information on the habitats of the immature stages of insects is presented, the arrangement being by orders.

Effect of cold weather upon insects in their wild habitats, J. R. WATSON (*Fla. Ent.*, 25 (1942), No. 1, pp. 14-15).

Insecticidal problems of entomological service, R. L. MILLER (*Fla. Ent.*, 25 (1942), No. 1, pp. 1-5).

Insect conditions in Florida in 1941, J. R. WATSON. (Fla. Expt. Sta.). (*Citrus Indus.*, 23 (1942), No. 2, pp. 6, 14).

[Entomological investigations by the Illinois Station]. (Coop. Ill. Nat. Hist. Survey and U. S. D. A.). (*Illinois Sta. Rpt.* 1938, pp. 150-174, 279-280, figs. 9).—A progress report (E. S. R., 82, p. 646) by M. D. FARRAR, C. M. WOODWORTH, D. HEUSINKVELD, J. H. BIGGER, B. KOEHLER, W. P. FLINT, R. O. SNELLING, O. T. BONNETT, S. R. GOLDEN, R. H. REED, L. H. SHROPSHIRE, C. C. COMPTON, A. E. RITCHER, S. C. CHANDLER, C. W. KEARNS, A. S. COLBY, and W. E. MCCAULEY, noting relation of alfalfa strains to leafhopper resistance; soybeans as a host for immature grasshoppers; lespedeza not subject to grasshopper destruction; seed corn treatment not valuable for insect control; dusting not a satisfactory control for corn earworm; relative resistance of corn inbreds to rootworms;

food preferences and diseases of armyworms; wheat-variety nursery for studies of hessian fly resistance; winter barley a preferred breeding ground for chinch bugs; white grub damage in relation to management; mineral oil insect baits show little spontaneous heating; control of squash bugs impractical on low-value crops; rotenone-bearing spray for control of the pea aphid; control of cyclamen and broad mites; pyrethrum for control of leaf tiers and leaf rollers; hot water forced into soil for control of nematodes; free nicotine as an insecticide in nutrient solutions; rosy apple aphid outbreak; wrapping trees for protection from borers; nonarsenical codling moth sprays for leaf-hopper control; peach tree borer control; jarring for control of plum curculio; San Jose scale studies; nicotine oleate for control of oriental fruit moth; new sprays for control of grape leafhoppers; notes on European elm scale; ant baits; sodium fluosilicate superior to sodium fluoride for clothes moth control; studies on insects attacking human food; termite control; and lice on Illinois cattle.

[Work in economic zoology and entomology by the Pennsylvania Station] (*Pennsylvania Sta. Bul.* 414 (1941), pp. 23-25, 29, 34-36, 55-56, figs. 3).—A progress report (E. S. R., 84, p. 495) by L. J. Bennett, P. F. English, W. C. Skoglund, W. C. Bramble, G. Trembley, R. L. Watts, L. Voris, H. N. Worthley, H. M. Steiner, and C. A. Thomas on protection through reduction of the open season for woodcock as the result of population studies; wheat and corn ideal feed for wild turkeys; corn and ragweed important as fall feeds of pheasants and quail; some woody plants utilized by deer only in winter; closed trout streams become overpopulated; digestible nutrients of feeds for rabbits; dynamite sprays; spray mix for mites and aphids; greenhouse symphylids in relation to dry soil; and rotenone for red mite spray mix.

Crop insects (*South Dakota Sta. Rpt.* 1941, pp. 59-64, fig. 1).—A progress report (E. S. R., 84, p. 786) noting research work with grasshoppers, by H. C. Severin; tillage as an aid in grasshopper control, by G. B. Spawn; and research work on blister beetles, by N. P. Larson.

[Entomological investigations by the Wisconsin Station]. (Partly coop. U. S. D. A. et al.). (*Wisconsin Sta. Bul.* 455 (1942), pp. 29-30, 34, 53-57, 65, 68-71, 81-82, figs. 5).—A progress report (E. S. R., 85, p. 503) by C. L. Fluke, E. M. Searls, H. F. Wilson, R. N. Janes, E. J. Campau, J. Lilly, A. Bertagnolli, T. C. Allen, J. A. Callenbach, C. Gerlach, C. L. Farrar, and C. W. Schaefer, noting the relation of the mirid plant bug to hay and pasture crop damage; northern corn rootworm damage as a cause of lodging; better and cheaper pea aphid control; insecticide blends for aphids; a dust for control of cabbage insects; the fruit tree leaf roller in the Kickapoo apple area; buffalo treehopper on apple and cherry trees; and nosema disease in bees.

Insectos y otros enemigos de la quinta [Insect and other enemies of the hacienda], C. A. LIZER Y TRELLIS (*Buenos Aires: Ed. Sudamer.*, [1941], pp. 214+[3]).

New species and biology of *Coccotrypes* and *Thamnurgides* (Scolytidae: Col[eo]ptera), C. F. C. BEESON (*Indian Forest Rec.*, n. ser., Ent., 5 (1939), No. 3, pp. 1+279-308).—Descriptions are given of new species of fruit and bark borers of the genera *Thamnurgides* (17) and *Coccotrypes* (5) discovered during a recent survey of the alternative food plants of *T. cardamomi* Schauff., a species which bores the fruits of cardamom.

Notes on food-plant relations of Scolytidae and Platypodidae in the Hawaiian Islands, O. H. SWEZEY. (Hawaii. Sugar Planters' Expt. Sta.) (*Hawaii. Ent. Soc. Proc.*, 11 (1941), No. 1, pp. 117-126).

Thysanoptera and Aphididae new to the island of Midway, F. A. BIANCHI. (Hawaii. Sugar Planters' Expt. Sta.). (*Hawaii. Ent. Soc. Proc.*, 11 (1941), No. 1, p. 37).

Orchard insects in 1941, W. D. WHITCOMB and A. I. BOURNE (*Mass. Fruit Growers' Assoc. Rpt.*, 48 (1942), pp. 64, 107-109).

[**Fruit insects and their control**] (*Pa. State Hort. Assoc. Proc.*, 83 (1942), pp. 59-61, 70-97, figs. 3).—Among the contributions presented at Harrisburg in January 1942 are the following: Peach Borer Control Tests (pp. 59-61) and Studies of Codling Moth Cover Sprays in 1941 (pp. 80-92), both by H. N. Worthley, and Dormant Sprays on Peach (pp. 74-79) and Apple Sprays—Dormant Through Petal-Fall (pp. 93-97), both by H. M. Steiner (all Pa. Expt. Sta.); and Report of Gypsy Moth in Pennsylvania in 1941, by T. L. Guyton (pp. 70-72).

Methods of insect control, I, II, D. ISELY (*Minneapolis, Minn.: Burgess Pub. Co.*, [1941], pt. 1, 2. ed., rev., pp. [1]+II+121; [1942], pt. 2, 3. ed., rev., pp. [1]+II+135).—These parts are presented in 19 and 18 chapters, respectively, each part including a list of references to the literature. An index to species and insecticides is given in part 2.

Some pertinent facts and some important theories about contact insecticides, W. C. O'KANE (*Pests*, 10 (1942), No. 3, pp. 16-19).

Fumigating action of a mixture of orthodichlorobenzene and naphthalene applied by a new method, W. N. SULLIVAN, E. R. MCGOVAN, and L. D. GOODRUE (U. S. D. A.). (*Pests*, 10 (1942), No. 4, pp. 16-17).

Caution urged in use of kerosene-rotenone spray, W. EBELING. (Calif. Citrus Expt. Sta.). (*Citrus Leaves*, 22 (1942), No. 4, pp. 1-2).

Grasshopper problems associated with strip cropping in western Kansas, D. A. WILBUR, R. F. FRITZ, and R. H. PAINTER. (Kans. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 1, pp. 16-29, figs. 5).—Report is made of an investigation conducted in Greeley County, Kans., in the dry-farming district, where a large area is devoted to strip cropping in order to prevent wind erosion. The widespread injury to fall wheat by *Melanoplus mexicanus* Sauss. at wheat-seeding time led to the conducting of this experiment with many variations, each with numerous replications. The details are presented in tables and graphs.

In Greeley County this grasshopper frequently has a partial or complete second generation, which in 1940 coincided with the germination of fall wheat. "The extent of the field margins of strip-cropped wheat as compared to solid-planted wheat greatly influenced the amount of feeding injury by *M. mexicanus* as well as the amount of bait required to check the infestation. Strips of fall wheat bordered by small grain stubble suffered much more extensive injury than when bordered by sorghums even though considerable populations of the grasshopper were present in the sorghums, indicating that even a partial replacement of wheat or barley by sorghums tends to alleviate the *M. mexicanus* problem. Weedy pastures, abandoned fields, and roadsides carried populations of [*M.*] *mexicanus* similar to those in the stubble, and the injury to adjoining wheatfields was comparable to that of fields adjoining stubble. Improving the condition of the pastures and eliminating the roadside strips are desirable measures for combating the grasshopper problem. Thirty times more bait was used during August and September than was used in May through July. Distributing grasshopper baits before seeding wheat resulted in a marked reduction in the extent of injury to the wheat as compared to baiting only after seeding."

Migrations and food preferences of the lubberly locust, J. R. WATSON (*Fla. Ent.*, 24 (1941), No. 2, pp. 40-42).

A single treatment for gladiolus corms to destroy all stages of the gladiolus thrips, J. B. STEINWEDEN, D. B. MACKIE, W. B. CARTER, and S. S. SMITH (*Calif. Dept. Agr. Bul.*, 31 (1942), No. 1, pp. 31-39, figs. 2).—The results of work conducted in which gladiolus corms were fumigated with methyl bromide at various schedules for the control of the gladiolus thrips and also to check the effect of this fumigant on the germination and blossom yields are reported. It is concluded that the recommended treatments should be 2 lb. per 1,000 cu. ft. for 3 hr. at 80° F. or 3 lb. for 2 hr. at 80°. Longer treatments are cautioned against to avoid injury to corms, while shorter treatments will probably reduce the kill of the thrips. The temperature of the corms and the fumigation chamber should reach 80° before the gas is injected, and this temperature should be maintained during the exposure period. Long periods of heating might reduce the relative humidity of the chamber to the point where corm injury might occur, so the relative humidity should be 60 percent or above. Treated corms should be protected from reinfestation.

Effect of certain weather conditions on chinch bug abundance at the Dry Land Field Station of the United States Department of Agriculture at Lawton, Okla., 1916-40, R. G. DAHMS and W. M. OSBORN. (U. S. D. A. and Okla. A. and M. Col.). (*Ecology*, 23 (1942), No. 1, pp. 103-106).

The daily flight of aster leafhoppers as determined by a light trap, J. G. LEACH and J. R. MULLIN. (W. Va. Expt. Sta.). (W. Va. Univ. Bul., 42. ser., No. 8-II (1942), pp. 93-95, figs. 2).

A description of *Aphis (Doralis) rumicis* L. and comparison with *Aphis (Doralis) fabae* Scop., M. G. JONES (*Bul. Ent. Res.*, 33 (1942), No. 1, pp. 5-20, figs. 7).—A review of the early literature on the occurrence of black aphids on dock has shown that confusion has arisen between two distinct species, the polyphagous bean-spindle aphid and the monophagous dock aphid. A discussion on the nomenclature of the two species follows, and the names *A. (Doralis) fabae* and *A. (Doralis) rumicis*, used on the European continent, are adopted. The different generations are described and figured. A comparison of *D. rumicis* and *D. fabae* shows that both colonies and single individuals can be distinguished easily from one another. The results of host transference experiments shows that *D. rumicis* only colonizes plants belonging to the genus *Rumex*, and the alatae viviparae show some slight response to the odor of dock. There is no gynopara as in *D. fabae*, and the sexupara gives rise to apterae viviparae, males, and oviparae.

Some grass aphid host records (Homoptera), G. F. KNOWLTON and W. D. FRONK. (Utah Expt. Sta.). (*Ent. News*, 53 (1942), No. 4, pp. 112-114, fig. 1).—This contribution includes a number of host records for aphids taken on grass in Utah, not given in the Patch Food-Plant Catalogue of the Aphids of the World (E. S. R., 81, p. 679). A new species found on grass at Lincoln in Tooele County is described under the name *Amphorophora allent*.

Mortality of the red scale on citrus through infection with a spore-forming bacterium, V. P. SOKOLOFF and L. J. KLORZ. (Calif. Citrus Expt. Sta.). (*Phytopathology*, 32 (1942), No. 3, pp. 187-198, figs. 3).—Adult females of California red scale can be infected and destroyed under laboratory conditions by a spore-forming facultatively anaerobic nitrate-reducing mesophilic bacterium, recently isolated from the soil, that is tentatively designated as *Bacillus* "C." The infected insects commonly contain bubbles of gas. Distortion of pygidia and browning of the ventral surface precede disintegration and drying of the dead individuals. A few days after the infection it may be observed growing in long chains on the waxy margin of the insect and, as vegetative cells and spores, in the contents of the general cavity. Expulsion of dead crawlers often occurs

in the early stages of the invasion. The pathogenicity of the micro-organism is lost after a period of growth on synthetic media but is restored upon its reisolation from sterile soil. The loss of pathogenicity is accompanied by a significant failure to grow anaerobically in the presence of nitrate. The lethal effect of the micro-organism is possibly associated with reduction of nitrate contained in the insects.

[California] red scale out-of-doors in Berkeley, California, E. O. ESSIG (*Pan-Pacific Ent.*, 18 (1942), No. 2, p. 82).

Kerosene-rotenone spray: Some of the problems attending its use as a control for red scale, W. ERELING. (Calif. Citrus Expt. Sta.). (*Calif. Citroy.*, 27 (1942), No. 7, p. 188).

Some problems of control of scale insects on citrus, W. L. THOMPSON. (Fla. Expt. Sta.). (*Citrus Indus.*, 23 (1942), No. 6, pp. 6-7, 14-15, 18-19).

Coleoptera associated with ironweed (Vernonia interior Small) in Kansas, R. B. SCHWITZGEBEL and D. A. WILBUR. (Kans. Expt. Sta.). (*Jour. Kans. Ent. Soc.*, 15 (1942), No. 2, pp. 37-44, figs. 5).—In the study reported at least 47 species comprising 14 families of Coleoptera were found in Kansas associated with *V. interior*, directly by feeding on the plant or indirectly as visitors.

A checklist of the Cicadellidae at Chatham, Virginia, with thirteen new records for the State, G. WENE and C. B. DOMINICK. (Va. Expt. Sta.). (*Va. Jour. Sci.*, 2 (1941), No. 5, pp. 122-123).

A new species of Hippodamia from Mexico (Coleoptera: Coccinellidae), P. H. TIMBERLAKE. (Calif. Citrus Expt. Sta.). (*Ent. Soc. Wash. Proc.*, 44 (1942), No. 3, p. 39).—Under the name *H. koebelii* description is given of a new ladybird beetle collected at several points in Mexico.

Biology of Calopepla leayana Latr. (Chrysomelidae: Col[eo]ptera) and the possibilities of control, P. F. GARTHWAITE (*Indian Forest Rec., n. ser., Ent.*, 5 (1938), No. 2, pp. IV+237-277, pls. 2).—A report is made on the synonymy and biology of the chrysomelid beetle *C. leayana*, which defoliates *Gmelina arborea*, a tree that has been planted in Burma on an extensive scale to supply pitwood for use in mines.

Descriptions and records of distribution of Phyllophaga (Coleoptera: Scarabaeidae), M. W. SANDERSON. (Ark. Expt. Sta.). (*Jour. Kans. Ent. Soc.*, 15 (1942), No. 2, pp. 49-55, pl. 1).—*P. sylvatica*, from Arkansas and other Middle West and Southeastern States, and *P. inopia*, from Arizona and Mexico, are described as new. Five additional species from the United States, of which four are recorded for the first time, are discussed.

The tribe Monochamini in the Western Hemisphere (Coleoptera: Cerambycidae), I. S. and E. S. DILLON (*Reading Pub. Mus. and Art Gallery, Sci. Pubs.*, No. 1 (1941), pp. [1]+135, pls. 5).—This monograph includes descriptions of many new species.

Bionomics of the meloid genus Hornia (Coleoptera), E. G. LINSLEY and J. W. MACSWAIN (*Calif. Univ. Pubs. Ent.*, 7 (1942), No. 9, pp. [2]+189-205, pls. 2, fig. 1).

Carpet beetles, C. J. WEINMAN. (Ill. Expt. Sta. and Ill. Nat. Hist. Survey). (*Pests*, 10 (1942), No. 4, pp. 6-8, 30-31).

The white pine weevil and its control by the application of concentrated sprays, S. F. PORTS, A. C. CLINE, and H. L. MCINTYRE. (U. S. D. A. et al.). (*Jour. Forestry*, 40 (1942), No. 5, pp. 405-410, figs. 4).—Details are given of the treatment of the white-pine weevil, which can be controlled effectively through the application of a poison spray that kills the female before the eggs are laid.

The biology and behaviour of Ptinus tectus Boie. (Coleoptera: Ptinidae), a pest of stored products, II, III (*Jour. Expt. Biol.*, 18 (1942), No. 3, pp.

278-305, *figs. 10*.—The second part of this contribution (E. S. R., 87, p. 95) relates to the amount of locomotory activity in relation to experimental and to previous temperatures, by D. L. Gunn and H. S. Hopf (pp. 278-289). The third part deals with the effect of temperature and humidity on oviposition, feeding, and duration of life cycle, by D. W. and R. F. Ewer (pp. 290-305).

Scolytus sulcatus and apple trees in relation to the Dutch elm disease control program, S. J. SMUCKER (U. S. D. A.). (*Phytopathology*, 32 (1942), No. 5, pp. 441-442, *fig. 1*).—It is concluded that even though *Ceratostomella ulmi*, the causative fungus of Dutch elm disease, is capable of remaining viable for considerable periods of time in living apple trees and also in apple wood, the probability of the bark beetle *S. sulcatus* transmitting it to apple wood in nature and of the apple wood being an important source of inoculum for later spread is relatively unimportant at present in the Dutch elm disease control program.

Height of corn as a factor in egg laying by the European corn borer moth in the one-generation area, L. H. PATCH. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 9, pp. 503-515, *figs. 3*).—More egg masses of the European corn borer were laid in fields of tall corn within an area than in fields of short corn, but the difference was less marked in areas where the general level of corn height was high. Where corn within a unit area averaged 32.4 in. in height, 8.3 times as many egg masses were laid in the fields of tallest corn as in fields of shortest corn; where corn in unit areas averaged 60.4 in. at the time of moth flight, only 1.7 times as many egg masses were counted in the fields of tallest corn. About twice as many egg masses were found in counties with corn above average in height as in counties with below-average corn, when data were grouped on a county basis without regard to unit areas within them. Apparently this did not result from higher levels of early summer infestations of egg masses in areas of tall corn preceded by higher levels of fall populations of borers. Moths were attracted as much more to fields of tall corn than to fields of short corn as they were to plats of tall corn than to plats of short corn within experimental fields.

Strains of field corn resistant to the survival of the European corn borer, L. H. PATCH, J. R. HOLBERT, and R. T. EVERLY (U. S. Dept. Agr., *Tech. Bul.* 823 (1942), pp. 22).—Open-pollinated varieties, inbreds, and hybrid strains of field corn were tested for their resistance to the survival of the European corn borer by infesting the plants with eggs produced in the laboratory. After allowing for the differences in maturity of the strains as measured by silking date, relatively low levels of mature borers were obtained during a 10-yr. period from resistant strains and high levels from susceptible strains. Partially resistant strains had intermediate borer levels. Open-pollinated varieties averaged 25 percent more than the predicted mean numbers of borers in strains silking on the same dates. Inbreds Ill. R4, Ia. L317, Wis. CC5, Mich. 77, and Mich. 106 averaged 32 percent less than the predicted numbers of borers; inbreds Ill. Hy, Ind. TR, U. S. 540, Ia. I205, Wis. CC1, Ill. A48, and Ill. L averaged 8 percent less than the predicted number of borers; and inbreds Ill. A, Ill. 90, Ind. WF9, and U. S. 187-2 averaged 33 percent more than the predicted number of borers. Single-cross hybrids involving two resistant inbreds averaged 39 percent less than the predicted numbers of borers. Hybrids involving two susceptible inbreds averaged 58 percent more than the predicted numbers of borers. Hybrids involving different combinations of resistant, partially resistant, and susceptible inbreds and hybrids involving two partially resistant inbreds contained populations of borers between these two extremes. The cumulative effect of an undetermined number of multiple factors in inbred lines in producing borer resistance in hybrids is indicated. A comparison of sister inbred lines, sepa-

rated at the second to the fifth generation of inbreeding, showed that the difference between sisters of pairs of sisters in transmitting borer resistance to hybrids averaged not much larger than the difference found between the members of pairs of samples of the same strains, indicating little advantage in testing sister strains.

Later planting reduces corn borer damage, L. L. HUBER (*Ohio Sta. Bmo. Bul.* 215 (1942), pp. 72-73, fig. 1).—A practical account which discusses the advantages of late planting of corn to reduce damage by the European corn borer.

The codling moth menace, W. D. WHITCOMB. (Mass. Expt. Sta.). (*Mass. Fruit Growers' Assoc. Rpt.*, 48 (1942), pp. 27-35).

The subterranean grass caterpillar, *Oxycanus* sp., chemical control investigations, 1940 season, L. J. DUMBLETON and R. D. DICK (*New Zeal. Jour. Sci. and Technol.*, 22 (1941), No. 6A, pp. 309A-322A, fig. 1).—In experimental control work with the subterranean grass caterpillar, a poison bait consisting of 1 lb. of paris green, 25 lb. of bran, 8 lb. of molasses, and 3 gal. of water gave a 77-percent reduction in larval population when applied at the rate of 60 lb. of wet bait per acre and a 63-percent reduction when applied at the rate of 120 lb. per acre to infested ground bare of grass. The same bait applied at the rate of 120 lb. per acre gave an 87-percent reduction in population when applied to infested plats on which grass was present.

Notes on the larvae of the three common injurious species of *Ephestia* (Lepidoptera: Phycitidae), H. E. HINTON (*Bul. Ent. Res.*, 33 (1942), No. 1, pp. 21-25, pl. 1, figs. 15).—Descriptive keys are given to the mature or nearly mature and the first-stage larvae of the Indian-meal moth, tobacco moth, Mediterranean flour moth, and the almond moth.

The "orange moth" of Dominica, B. W. I., R. G. FENNAH (*Trop. Agr. [Trinidad]*, 19 (1942), No. 4, pp. 73-78, figs. 2).—The orange moth, thought to be a new species of the genus *Gymnandrosoma* (family Olethreutidae) and here reported upon, causes a small seasonal loss of fruit from time to time in upland parts of Dominica. The larvae bore into the developing fruit, affording entry for various fungi.

Some observations on the life history of the Angleshades moth *Brotolomia meticulosa* L., W. J. PARR and E. R. SPEYER (*Ann. Appl. Biol.*, 28 (1941), No. 1, pp. 29-33, pl. 1).—Report is made of observations of *B. meticulosa*, a moth which is common and widely distributed in Europe and often inhabits glasshouses, especially those devoted to cultivation of chrysanthemums. The caterpillars are very destructive to chrysanthemum flowers and at least in the later instars prefer petals to foliage, although they have been reared with ease entirely upon the latter. They feed voraciously upon leaves of cineraria and geranium and caused much injury to those of broad beans grown under glass during the winter of 1939-40.

New Jersey mechanical trap for mosquito surveys, T. D. MULHERN (*New Jersey Stas. Cir.* 421 (1942), pp. 8, figs. 3).—A practical account, including a description of a mechanical trap, selection of proper location for operation, method of operation, suggestions for trap service, and interpretation of results.

Mosquitoes of the Ethiopian region.—III, Culicine adults and pupae, F. W. EDWARDS (*London: Brit. Mus. (Nat. Hist.)*, 1941, vol. 3, pp. VIII+499, pls. 4, figs. 184).—The third volume of this work (*Il. S. R.*, 81, p. 548) deals with the adults and pupae of culicine mosquitoes under headings of taxonomy of adults (pp. 6-353) and of pupae (pp. 354-428), includes corrigenda and addenda (pp. 429-447), and discusses the zoogeography of Ethiopian mosquitoes (pp. 448-485). A six-page list of references to the literature is included.

The fever fly *Dilophus febrilis* L. and methods for control of its larvae in cultivated lawns, E. E. EDWARDS (*Ann. Appl. Biol.*, 28 (1941), No. 1, pp. 34-38).—The symptoms of attack by larvae of *D. febrilis* in lawns under conditions of continual mowing and a brief description of its life history are presented. Report is made of control experiments conducted in 1939 with calomel, orthodichlorobenzene, lead arsenate, and derris preparations applied against larvae in cultivated lawns. Lead arsenate at 1.5 oz. per square yard and also a derris-pyrethrum mixture (0.0054 percent rotenone and 0.001 percent pyrethrin I) used at 1 gal. per square yard gave almost complete control. A liquid derris preparation alone (0.0054 percent rotenone) gave on the average about 95-percent control and an emulsion containing 1 percent orthodichlorobenzene about 72 percent control, both applied at 1 gal. per square yard. A 4-percent calomel dust at $\frac{3}{8}$ oz. per square yard was ineffective.

Sampling for leatherjackets with orthodichlorobenzene emulsion, H. F. BARNES (*Ann. Appl. Biol.*, 28 (1941), No. 1, pp. 23-28, figs. 2).—The orthodichlorobenzene method has been found satisfactory for estimating rapidly the numbers of leatherjackets (tipulid larvae) present early in the year, providing it is used on suitable days, i. e., damp rather than dry ones and warm rather than frosty ones. About 80 percent of the leatherjacket population is then obtained. Later in the season when the leatherjackets are approaching their fully fed stage, the method is unreliable. For one reason the leatherjackets appear to become immune to orthodichlorobenzene and, secondly, at this period a definite movement away from the original feeding site appears to take place. The dates when the treatment becomes ineffective vary from year to year, but generally speaking it is effective till the end of March, although it may be used some years throughout April with good results.

The crane flies (Tipulidae) of the George Reserve, Michigan, J. S. ROGERS (*Mich. Univ., Mus. Zool. Misc. Pub.* 53 (1942), pp. 128, pls. 8, fig. 1).—Following the introduction, the seasonal distribution (pp. 18-30), habitat distribution (pp. 30-55), relationships of the crane fly fauna with the other members of the biota (pp. 55-57), an annotated list (pp. 58-118), and additional notes for the spring of 1941 (pp. 118-127) are presented.

Notes on *Theresia claripalpis* Wulp (Diptera: Tachinidae), a parasite of *Diatraea* spp. in Trinidad, B. W. I., E. M. CALLAN (*Trop. Agr. [Trinidad]*, 19 (1942), No. 4, pp. 71-73).—A total of 4,232 *Diatraea* larvae were found in 18,497 sugarcane "dead hearts" cut in the field on an estate (Caroni) in Trinidad in 1941. "*D. impersonatella* Wlk. was the most abundant moth borer; 69.2 percent of the moth borers were this species, 29.8 percent *D. canella* Hmps., and 1.0 percent *D. saccharalis* F. *T. claripalpis* was the only tachinid parasite found. Neither *Stomatoderia diadema* Wied. nor the Amazon fly *Metagonistylum minense* Tns. were obtained. It is suggested that the Amazon fly (introduced into Trinidad in 1936 and 1937) has not become established at Caroni Estate. A total of 399 puparia of *T. claripalpis* were obtained; 231 were 'field collected' and 168 'lab reared.' *T. claripalpis* showed a distinct host preference for both *D. saccharalis* and *D. impersonatella*; 8.9 percent of *D. saccharalis* were parasitized, 5.4 percent of *D. impersonatella*, and 0.4 percent of *D. canella*." A successful method of shipment of live puparia of *T. claripalpis* from Trinidad to Canada is described.

A new species of Oedematocera, with notes and key (Tachinidae: Diptera), H. J. REINHARD. (Tex. Expt. Sta.). (*Ent. News*, 53 (1942), No. 4, pp. 106-108).—A key is given for the identification of the species of *Oedematocera* and a description of *O. optata* n. sp. taken at Cold Spring Harbor, N. Y.

Notes on Fabriciella, with descriptions of five new species (Tachinidae: Diptera), H. J. REINHARD. (Tex. Expt. Sta.). (*Bul. Brooklyn Ent. Soc.*, 37 (1942), No. 1, pp. 24-30).

The parasitic fly *Zelia vertebrata* Say (Diptera: Dexiidae), J. F. MANGRUM (*Ann. Ent. Soc. Amer.*, 35 (1942), No. 1, pp. 73-75, figs. 9).—A brief account is given of observations of the dexiid fly *Z. vertebrata*, found to parasitize the large larvae and pupae of the horned passalus.

***Sarcophaga bullata* Parker as a cause of intestinal myiasis,** J. R. WATSON (*Fla. Ent.*, 25 (1942), No. 1, pp. 5-6).

The apple maggot problem again: Recent observations and trapping experiments, D. M. BENJAMIN and A. C. HODSON. (Minn. Expt. Sta.). (*Minn. Hort.*, 70 (1942), No. 3, pp. 54-55).

The house fly as a vector of food poisoning organisms in food-producing establishments, M. OSTBOLENK and H. WELCH (*Amer. Jour. Pub. Health*, 32 (1942), No. 5, pp. 487-494, figs. 2).—Experimental work has shown that flies fed on food infected with *Salmonella enteritidis* are capable of infecting other flies as well as the food, water, and miscellaneous surfaces with which they come into contact. *S. enteritidis* apparently survives in the fly for the duration of the life of the fly, approximately 4 weeks. Transfer of *S. enteritidis* infection from infected flies to mice and the retransfer of infection from infected mice to flies was successfully carried out. Fly eggs planted in mash infected with *S. enteritidis* resulted in infected maggots, pupae, and adults.

Housefly control in relation to poliomyelitis, G. E. SANDERS (*Pests*, 10 (1942), No. 3, pp. 22-26).

Poliomyelitis virus from flies, J. A. TOOMEY, W. S. TAKACS, and L. A. TISCHER (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 3, pp. 637-639).—The isolation of poliomyelitis virus from flies exposed to natural sources of infection is reported.

Index to the literature of Siphonaptera of North America, W. L. JELLISON and N. E. GOOP (*U. S. Pub. Health Serv., Natl. Inst. Health Bul.* 178 (1942), pp. IV+193).—This systematically arranged catalog index to the fleas of North America includes hosts and localities of collection, a guide to type localities, a bibliography of 18 pages, and an index.

Poisoning of the honeybee, C. G. BUTLER (*Bee World*, 23 (1942), No. 5, pp. 38-39).—A contribution from the Rothamsted Experimental Station.

Further observations on the resistance of bees to American foulbrood, J. E. ECKERT. (Univ. Calif.). (*Amer. Bee Jour.*, 82 (1942), No. 6, pp. 261-262).—A further report of bee resistance to American foulbrood (*E. S. R.*, 86, p. 364).

Argentine ant in Hawaii, E. C. ZIMMERMAN (*Hawaii. Ent. Soc. Proc.*, 11 (1941), No. 1, p. 108).—This note records the discovery of the Argentine ant in the Hawaiian Islands for the first time, it being well established at Fort Shafter in Honolulu.

Tick parasites on Cape Cod, S. COBB (*Science*, 95 (1942), No. 2472, p. 503).—Attempts made in July and August 1940 to parasitize the American dog tick with *Hunterellus hookeri* How. failed, although five adults were collected in the hair of a Setter dog. One larva of this tick yielded two specimens of *Ixodiphagus texanus* How. This is believed to be the first report of this chalcid as a parasite of the American dog tick, although there are a number of records from Oak Bluffs, Mass., of its parasitism of the rabbit tick and of *Ixodes dentatus*.

The sex-ratio in the Hymenoptera: A function of the environment, S. E. FLANDERS. (Calif. Citrus Expt. Sta.). (*Ecology*, 23 (1942), No. 1, pp. 120-121).

A check list of the parasitic Hymenoptera of the Samoan Islands, with descriptions of new species appended, D. T. FULLAWAY (*Hawaii. Ent. Soc. Proc.*, 11 (1941), No. 1, pp. 41-49).

Rust mites on citrus, J. R. WATSON. (Fla. Expt. Sta.). (*Citrus Indus.*, 23 (1942), No. 5, pp. 3, 14).

Primera contribución al estudio de la bionomía del *Argas persicus* [A contribution on the biology of the fowl tick], R. J. ROVEDA (*Buenos Aires Univ., Inst. Parasitol. y Enferm. Parasit.* [Pub.], 1 (1940), No. 6, pp. 22).

Notes on the life cycle of *Capillaria annulata*, P. J. ZUCCHERO (*W. Va. Univ. Bul.*, 42. ser., No. 8-II (1942), pp. 96-106).

ANIMAL PRODUCTION

[Investigations dealing with livestock production by the Illinois Station] (*Illinois Sta. Rpt.* 1938, pp. 79-86, 95-105, 108-110, 130-136, figs. 2).—H. P. Rusk, R. R. Snapp, S. Bull, R. J. Webb, T. S. Hamilton, W. Burroughs, B. W. Fairbanks, W. E. Carroll, W. G. Kammlade, G. A. Branaman, E. Roberts, J. H. Longwell, and F. Simpson report on progress made on investigations of the effect of cane molasses as a substitute for all or part of the corn in the ration of yearling steers on gain, grade, and quality of meat produced; rye for winter pasture of sows; protein needs of growing-fattening pigs; sows with pigs thrive on rye pasture, with shelled corn and protein supplement; fermenting farm grains with yeast for swine; fattening values of rations fed to lambs on different kinds of pasture; rats show preference for inbred and hybrid corn; and the effect of oat flour as a preservative for fat in pork products.

[Experiments in animal production for the Pennsylvania Station] (*Pennsylvania Sta. Bul.* 414 (1941), pp. 26-27, 29, 40-43, figs. 2).—Results are briefly reported by W. L. Henning, E. B. Forbes, R. W. Swift, R. V. Boucher, P. H. Margolf, and R. R. Murphy on comparisons of three and four breed crosses in sheep for early lamb production; the base value of heat production of animals; the use of molasses to replace corn in poultry rations; the need by turkey hens of riboflavin if fertile eggs are to be produced; vitamin D requirements of growing turkeys; and the reduction of feed costs of turkeys on range by the use of whole oats.

[Investigations in animal production by the South Dakota Station] (*South Dakota Sta. Rpt.* 1941, pp. 13-18, 19-22, 40-46, 46-47, figs. 2).—Results are briefly reported by T. Wright, F. U. Fenn, I. B. Johnson, J. C. Watson, J. W. Wilson, W. E. Poley, W. O. Wilson, A. L. Moxon, H. D. Anderson, J. B. Taylor, and R. L. Dolecek on a comparison of several protein supplements for pigs after weaning; quality of pork produced on pasture; comparison of ground and whole Sooner milo with corn for fattening fall pigs; baby beeves economically produced; comparison of rations containing corn, cane, and millet for fattening steers; comparative rations for pregnant ewes; progress with the notall breed of sheep (E. S. R., 83, p. 756); carrying capacity of South Dakota ranges and pastures; beet tops and beet pulp for lambs; sorghums and proso millet for turkeys; effect of rations on fertility and hatchability of turkey eggs; use of supplements, particularly linseed meal, to selenium rations for the laying hen; relation of egg quality and poultry meat to grain varieties; and different percentages of protein for egg production.

[Experiments by the Wisconsin Station with cattle, swine, and poultry] (*Wisconsin Sta. Bul.* 455 (1942), pp. 1-5, 8-18, figs. 7).—Results are briefly presented by W. H. Peterson, G. P. Bahler, R. P. Niedermeler, G. Bohstedt, I. W. Appel, F. W. Duffee, B. Ross, J. Fargo, W. C. Weir, P. Phillips, J. C. Halpin,

W. W. Cravens, C. E. Holmes, and H. Lardy, concerning the preservation of grass silage; liberal alfalfa in rations for pigs gives high returns; sunshine and minerals for pigs; excess magnesium harmless for pigs; poultry rations; distillers' waste not good protein supplement for poultry; salt and protein feeds prevent cannibalism in poultry; sunlight helps prevent slipped tendon or perosis in growing chicks; and artificial insemination in poultry.

The evaluation of feeds on the basis of digestible and metabolizable nutrients, H. H. MITCHELL. (Univ. Ill.). (*Jour. Anim. Sci.*, 1 (1942), No. 2, pp. 159-173).—A discussion by the Committee on the Evaluation of Feeds of the American Society of Animal Production points out the various factors that should be considered in the conduct of metabolism, digestion, and energy experiments, with special reference to the chemical composition of feeds and their influence on digestibility.

Carotene and riboflavin in alfalfa, A. R. HANKE and A. T. PERKINS. (Kans. Expt. Sta.). (*Poultry Sci.*, 21 (1942), No. 3, pp. 195-199, fig. 1).—An analysis by chemical methods of alfalfa meals collected in Kansas showed variations in the carotene content from 1.27 to 8.41 mg. per 100 gm. in 28 samples from sun-cured plants and 0.93-40.64 mg. per 100 gm. for 71 samples from dehydrated hay. In these products the ranges of riboflavin were 7.80 to 22.03 and 8.95 to 32.46 mg. per gram. In general, the dehydrated products were superior to the sun-cured products, and leaf meals were superior to the meals from the whole plant as sources of the carotene and riboflavin. Variations in the riboflavin were not as great as those for carotene.

The effect of manganese sulphate on the stability of vitamins A and D of cod liver oil when stored in mixed feeds, M. W. MILLER, V. JOUKOVSKY, and N. HOKENSTAD (*Poultry Sci.*, 21 (1942), No. 3, pp. 200-202).—Manganese sulfate acts as a drying agent on cod-liver oil. Assays showed it to cause the destruction of vitamins A and D when 0.5 percent of it and 9 percent of the oil was mixed with bran. There was no tendency to lose vitamin D in mixtures in which the manganese did not come in contact with the cod-liver oil. The vitamin D studies were made on mixtures stored up to 11 mo. at room temperature.

Correction of heat production for changes in live weight of cattle in balance experiments, R. W. SWIFT. (Pa. Expt. Sta.). (*Jour. Anim. Sci.*, 1 (1942), No. 2, pp. 145-148).—Because of differences in the alimentary fill of cattle, suitable corrections and changes in live weight seem necessary in balance experiments. Carbon and nitrogen were shown to afford a more significant basis than live weight for judgment of gain or losses of body substances during periods of constant feed intake in successive trials with a steer. A correction for general use was computed as 432 kg. live weight and 7,181 Calories of heat production per day, which was the average of values for four steers on rations from fast to three times the maintenance, as computed by Forbes et al. (*E. S. R.*, 62, p. 656). The slight change in the correlation would result only in an increase of the slope of the curve for heat production in the previous publication.

Studies on large and small type Hereford cattle, R. R. WOODWARD, R. T. CLARK, and J. N. CUMMINGS (*Montana Sta. Bul.* 401 (1942), pp. 18).—A herd of grade Hereford cows was divided into small and large types and mated to bulls of these types for 9 yr. Study was made of the effect on cows, calves, yearlings, and 2-year-old heifers and steers of full feeding and limited rations which maintained weight during the winter on the heifer and steer calves. Those from the large type parents were generally larger at the different ages. Winter and summer gains of the large type were greater for both heifers and

steers in the full feed groups, but there was little difference in winter gains of helpers on the limited rations. Summer gains were mainly inversely proportional to winter gains. The birth weights of calves were found to be affected more by the type of their parents than by the ration fed. Steers from the large types were generally calculated as more profitable than steers from the smaller type sires and dams.

Growth and production factors in range cattle, B. KNAPP, JR., A. L. BAKER, J. R. QUESENBERRY, and R. T. CLARK. (Coop. U. S. D. A.). (*Montana Sta. Bul.* 400 (1942), pp. 13, figs. 3).—The average weights of 770 calves from 112 purebred Hereford cows raised at the U. S. Range Livestock Station from 1926 to 1940 are tabulated for birth and weaning weights at approximately 175 days of age and with reference to the dam's weight the previous fall. The average maximum production of range cows, judging from their weights and weights of their calves at birth and weaning, were reached at 4–8 yr. There were small changes in mature weight of the cows after 3.5 yr. of age. Analyses of variance showed that cows were responsible for 20 percent of the variation in the weaning weights of their calves. Other factors accounting for significant variations in the weaning weights of the calves were sires, age of weaning, and nutrition of the dam during the suckling period. Consideration should be given to the ability of the cow to reproduce rather than the condition of the cow in the selection for range breeding.

Comparative ripening of beef from grass-fattened and grain-fattened steers, N. G. BARBELLA, B. TANNOR, O. G. HANKINS, and R. E. HUNT. (U. S. D. A. coop. Va. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 9, pp. 517–521).—No significant difference was found in the rates of ripening, flavor, aroma, or expressible juice of beef from steers about 2.5 yr. of age fattened on bluegrass pasture in comparison with beef from steers fattened in dry lot on corn, cottonseed meal, and hay. The comparative tests were carried on in 3 yr. with storage of similar prime rib cuts for averages of 15.7 and 50 days. The beef from different lots showed similar degrees of fatness of the eye muscle. Chemical tests of beef from the two groups in each test bore out the similarity of ripening. The sulphydryl content of the beef from the grass-fattened cattle was higher due to the higher sulphydryl content of the grass ration, but it had no bearing on the rate of ripening. The chemical indices of protein break-down were similar for both types of feeding. Two lots of 20 steers each were fed or carried in the pasture for about 5 mo.

Eastward sheep drives from California and Oregon, E. N. WENTWORTH (*Miss. Val. Hist. Rev.*, 28 (1942), No. 4, pp. 507–538).—An account of sheep drives and the shifting of "the surplus wool producing areas from eastern farm belt to canyon, mountain, and meadow of the great expanse from the High Plains to the Pacific coast."

Wool yields in the small side-sample as related to individual whole-fleece yields in four breed-groups of sheep, R. G. SCHOTT, E. M. POHLE, D. A. SPENCER, and G. W. BRIER. (U. S. D. A.). (*Jour. Anim. Sci.*, 1 (1942), No. 2, pp. 137–144, fig. 1).—The fleece yields of 174 ewes were calculated from small-sample yields from the middle of the right side using the formula $X = \frac{Y-a}{b_{y.x}}$,

wherein X is the whole sample yield. The values for a are -2.86 , -1.62 , -0.84 , and $+0.73$, respectively, for Rambouillet, Targhee, Corriedale, and Columbia ewes. The value of $b_{y.x}$ was 1.08 for all groups. A graph permitting reading whole-fleece values from small-sample yields for each breed is presented.

The limitations of oat straw as a roughage for maintenance, lactation, and growth in sheep, C. L. SHREWSBURY, C. HARPER, F. N. ANDREWS, and M. R.

ZELLE. (Ind. Expt. Sta.). (*Jour. Anim. Sci.*, 1 (1942), No. 2, pp. 126-130).—Nonleguminous rations of yellow corn, corn silage, and oat straw, supplemented in different lots with casein, cod-liver oil, and alfalfa hay ash, did not produce optimum milk production in ewes as judged by the growth of the lambs. The experiment was conducted with 6 lots of 15 ewes each, the milk production being estimated by changes in the weights of lambs after nursing after 3-hr. separation from the ewes. A control lot received alfalfa hay in place of oat straw. In milk production the lots of ewes ranged in the order of alfalfa hay roughage and with supplements to the oat straw of casein and cod-liver oil, casein alone, no supplements, alfalfa ash, and cod-liver oil alone. The best gains before weaning were made by the lambs whose dams were on casein and cod-liver oil with the oat straw. Alfalfa hay was second, with casein as the single supplement to oat straw nearly as good. Cod-liver oil with oat straw and oat straw alone or with alfalfa ash did not stimulate growth so well. Twins did not do as well as singles, but they both showed similar responses to the rations.

The effect of fluorine in rock phosphate in the nutrition of fattening lambs, J. D. HATFIELD, C. L. SHREWSBURY, and L. P. DOYLE (Ind. Expt. Sta.). (*Jour. Anim. Sci.*, 1 (1942), No. 2, pp. 131-136).—Varying amounts of rock phosphate containing 3.85 percent fluorine fed as a mineral supplement to yellow corn and alfalfa hay to lots of five lambs each furnishing 1.5, 3.0, and 6.0 mg. per kilogram body weight over a 170-day period were compared with no mineral supplement as to the gains, consumption, bone strength and ash, blood calcium and phosphorus, and thyroid weight and composition. In the lot receiving the largest amounts of fluorine by capsule grain consumption, weight of the thyroid glands, blood calcium, and breaking strength of the bone per unit of weight were reduced. Grain consumption and gains were greatest with the medium amounts of rock phosphate.

Nutritional deficiencies of a concentrate mixture composed of corn, tankage, soybean oilmeal, and alfalfa meal for growing pigs, T. B. KEITH, R. C. MILLER, W. T. S. THORP, and M. A. MCCARTY. (Pa. Expt. Sta.). (*Jour. Anim. Sci.*, 1 (1942), No. 2, pp. 120-125).—The occurrence of a painful stiffness at 150 lb. live weight in 30 of 60 pigs started at 70-100 lb. on rations of corn, tankage, soybean meal, sun-cured alfalfa, and salt has been noted (E. S. R., 85, p. 95). The condition was first observed with a ration having a mineral content of 6-9 percent and low in manganese (0.0011-0.0014 percent). Additions of manganese sulfate (erroneously designated magnesium in the previous abstract) supplying 50-60 p. p. m. prevented stiffness but did not cure it. Feeding 0.2 lb. of manganese sulfate per 100 lb. of basal ration to young pigs, 26-40 lb. in weight, reduced the rate of gain as compared with those showing stiffness. Two of the 5 pigs so treated died. After feeding 100 gm. daily of pork liver for 63 days 1 pig gained 53 lb. In another experiment 40 pigs, 18-30 lb. in weight, were fed on the basal ration of corn, tankage, or tankage and soybean meal, with alfalfa for 56 days and produced emaciation, weakness, vomiting, and dermatitis. The nutritional factors required to prevent mild dermatitis and ataxia were not supplied by supplementing this ration with 100 gm. of brewers' yeast, 40γ of beta carotene per day, a mixture of the B vitamins, or 100 gm. of beef liver per day. Limited responses were produced with supplements of alcoholic extracts of pork liver and a combination of soybean meal, yeast, and carotene. The nutritional factors required were not supplied by yeast alone or pure B vitamins.

The minimum requirement of pantothenic acid for the growing pig, E. H. HUGHES and N. R. ITTNER. (Univ. Calif. coop. U. S. D. A.). (*Jour. Anim. Sci.*,

1 (1942), No. 2, pp. 116-119, fig. 1).—A study of the growth of pigs on purified diets with varying amounts of pantothenic acid showed the minimum daily requirement for the growing pig was between 7.8 and 11.8 mg. per 100 lb. live weight. The experiment was conducted with four groups of five pigs each averaging 30.6 lb. per head. The amounts of pantothenic acid provided daily in the respective lots were 0, 3.6, 7.8, and 11.8 mg. per 100 lb., and the average daily gains over the 63-day period were 0.06, 0.4, 0.4, and 0.6 lb., respectively. The lack of pantothenic acid caused poor growth, hemorrhages in the digestive tract, and abnormal gait.

Pantothenic acid deficiency studies in dogs, A. E. SCHAEFER, J. M. MCKIBBIN, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 143 (1942), No. 2, pp. 321-330, figs. 3).—The requirement of growing puppies seems to be 100% of calcium pantothenate per kilogram of body weight per day, but less than this amount was required by the adult. Deficiency in this vitamin was characterized by prostration after 3-4 weeks on the basal sucrose-casein ration (E. S. R., 83, p. 236), supplemented with the essentials except pantothenic acid. Post mortem examinations showed severe fatty livers and abnormalities of the kidney, thymus, and intestinal tract. Blood studies showed that the plasma calcium in inorganic phosphorus remained essentially normal during the pantothenic acid deficiency. Delays in the response of deficient animals to oral or intravenous administration of pantothenic acid with and without glucose or liver extract was considered due to considerable repair of tissue damage being needed. Grayling in dogs with about 500% of pantothenic acid per kilogram would seem to eliminate the responsibility of this factor as claimed by Morgan and Simms (E. S. R., 84, p. 419). Choline supplements to the rations ruled out this as a cause of kidney lesions.

Types of fur fibers, T. M. P. and J. I. HARDY. (U. S. D. A. et al.). *Jour. Hered.*, 33 (1942), No. 5, pp. 191-199, figs. 5).—Microscopic examination of the skins and fibers of prime silver fox and mink pelts showed three main types of fibers to contribute materially to the quality, the under fur fibers, regular guard hairs, and the single guard hairs. Specialized hair was present in the tail gland and in a tuft near the navel. Permanent mounts were made with a plastic impression which revealed surface characteristics of fibers from different locations and different species.

Constituents of poultry feeds, R. V. BOUCHER. (Pa. State Col.). (*Flour & Feed*, 42 (1942), No. 12, pp. 7-8, 26-27).—Essentially a summary of the vitamin needs of poultry together with the feed sources of each.

The effect of diminishing the proportion of starch in the feed of laying hens, G. D. BUCKNER, W. M. INSKO, JR., and A. HARMS (*Kentucky Sta. Bul.* 423 (1942), pp. 18).—Substituting distillers' corn dried grains or other feeds low in starch for all or part of the yellow corn containing 60-70 percent starch in a ration of 29 laying hens over an 18-week period did not materially affect the number of pounds of eggs, dry shell, white, wet yolk, dry yolk, and fat in the yolk produced by these hens. However, analyses of the bodies showed an average of 0.62 lb. of fat per hen in those which had received 53.5 percent corn meal as compared with an average of 0.14 and 0.15 lb. of fat per hen in groups in which all the corn was replaced by low starchy feeds. The fat in the body of the laying hen appeared to be derived primarily from starch and not from protein or fat, confirming previous findings in growing chicks (E. S. R., 80, p. 529). Egg yolk fat was affected less by the ration than body fat, and there was no correlation between the color of the yolk and the hatchability of the eggs. The addition of distillers' corn dried grains in the mash did not interfere with palatability, but it seemed to have a deleterious effect on the health of the birds. The oil in the

urophygeal gland was smallest in birds receiving rations containing the largest amounts of corn. Data are presented on the composition of the feeds and representative samples of the uropygeal oil in the glands, body fat, droppings, and eggs after the 18-week period on the test ration in comparison with feeding on the control ration with more than 50 percent yellow corn.

The study of calcium metabolism in the laying hen by the comparative slaughter method. C. L. MORGAN, J. H. MITCHELL, R. C. RINGROSE, and E. J. LEASE. (S. C. Expt. Sta.). (*Poultry Sci.*, 21 (1942), No. 3, pp. 212-215).—During the period following the onset of laying the hen goes into a negative calcium balance, even though she may be supplied with ample calcium in the ration. Such hens later remove calcium from the skeleton and the calcium is regained without cessation of laying. These conclusions were derived from comparative analyses of 11 hens at the onset of laying, for 6 hens in metabolism trials for 6 weeks, and for 6 hens after several months of production. The percentage calcium in the live weight before laying was 1.065, after 6 weeks' laying 0.85, and after several months' production 1.045 on rations containing 2.4 percent calcium and 15.94 percent protein. Like results were obtained with the hens in metabolism cages and in laying pens, and by Common and Hale (E. S. R., 87, p. 409).

Studies in mineral nutrition of laying hens.—I, The manganese requirement. M. S. GUTOWSKA and R. T. PARKHURST. (Mass. Expt. Sta.). (*Poultry Sci.*, 21 (1942), No. 3, pp. 277-287, figs. 5).—Laying hens fed rations for 12 lunar months containing 17-74 p. p. m. of manganese were in normal physiological condition. Good production, fair egg size, egg texture, normal fertility, and hatchability were attained by all groups. Body weight, hemoglobin content of the blood, and ash in the bones were physiologically normal. On the other hand eggshell breaking strength, eggshell weight, and yolk weight were slightly greater with the higher manganese rations. The study was conducted with 2 groups of 48 Single Comb Rhode Island Red pullets with an all-mash ration to which supplements of commercial ground limestone or plain calcite flour were added.

The controlled feeding of laying pullets. H. TEMPERTON and F. J. DUDLEY (*Harper Adams Util. Poultry Jour.*, 27 (1942), No. 4, pp. 73-76).—Limiting groups of crossbred poultry to 20 and 40 percent potato meal with 30 and 50 percent town waste showed that there was a slight lowering of egg production, and when the feed was restricted to 3.48 oz. per head daily the egg production was substantially lowered. Similar results were obtained in regard to body weights. It thus appears definite that although the efficiency of production may be increased by smaller amounts of feed the total production of eggs and weight are reduced.

Making the most from pasturage for chickens. D. C. KENNARD and V. D. CHAMBERLIN (*Ohio Sta. Bmo. Bul.* 215 (1942), pp. 59-62, fig. 1).—The use of clover and bluegrass range or other succulent feeds as sources of vitamins A, D, and riboflavin is recommended as a supplement for the chick starter ration to 7-8 weeks of age, followed by the grower ration including whole oats and yellow corn.

Effects of nutrition on variability in the growth of chickens. J. C. HAMMOND and H. R. BIRD. (Md. Expt. Sta. coop. U. S. D. A.). (*Poultry Sci.*, 21 (1942), No. 3, pp. 230-242, figs. 2).—An analysis of the growth in 40 lots of 25 chicks each at the Beltsville Research Center with differences in the physical composition of the rations and nutrients supplied showed that variability in growth may be increased and prolonged by any defect in the diet which prevents normal development. Variability was reduced by individual rationing

and by partial starvation. A partial deficiency of vitamin A and large quantities of indigestible material as ground paper increased variability. Dextrinized starch had a more adverse effect on growth than paper flour but did not affect variability. Chicks fed individually and on diets low in pantothenic acid showed low variability as also was the case with excessive amounts of vitamins. Correlations of the weights of 130 chicks at intervals showed that live weight was more closely correlated with following weights than with those preceding. With the variability encountered it is pointed out that differences in the efficiency of feed utilization will become smaller as live weight increases. The distribution of variability in chick weights should be considered before starting an experiment and the number and age of chicks needed. "Under usual conditions it takes twice as many chicks at 6 weeks of age to demonstrate the significance of a 20 percent difference between means as it does at 14 weeks of age or older." Because of sexual variations, more chicks were required after 4 weeks of age to demonstrate significant differences if ♂s and ♀s were both considered than if they were fed separately.

Further observations on choline and yeast in chick nutrition, P. R. RECORD and R. M. BETHKE. (Ohio Expt. Sta.). (*Poultry Sci.*, 21 (1942), No. 3, pp. 271-276).—Approximately 0.15 percent of choline was needed by the chick to give maximum results in growth. Some other factor or factors similar to the alcohol-precipitate factor of yeast (R. of Schumacher et al.) (E. S. R., 84, p. 94) was also essential. Soybean phosphatides and lecithin to the extent of 1.5 percent of the basal ration were effective in promoting growth and controlling perosis. Additions of 0.15 percent methionine increased growth but did not prevent perosis. These studies were conducted in four experiments with tests of the supplements added to a basal ration of corn meal, peanut meal, casein, cane molasses, soybean oil, and minerals and vitamins received in lots of 20 and 14 chicks each during an 8-week period.

The interrelationship of manganese, phosphatase, and vitamin D in bone development, G. F. COMBS, L. C. NORRIS and G. F. HEUSER. (Cornell Univ.). (*Jour. Nutr.*, 23 (1942), No. 2, pp. 131-140).—It was found that the bone phosphatase of the femur and tibia of rachitic chicks was increased to abnormally high levels as reported by Robison for the rat.³ The bone phosphatase was decreased to approximately normal levels by the omission of excess manganese from the ration of chicks on a rachitogenic diet, but was about doubled when manganese was included. However, with the omission of manganese the perosis index was very high. These results showed an intimate relation between phosphatase activity of the bones and the manganese content of the diet. These studies were conducted in two experiments with lots of 6-14 chicks each receiving basal rations containing either cod-liver oil supplying vitamin D or 5-7 mg. of manganese per 100 gm. of ration or both. The chicks were fed to 4, 6, and 8 weeks of age.

A study on the administration of hesperidin, ascorbic acid, and massive doses of vitamin D to vitamin K-deficient chicks, J. T. CORRELL and E. C. WISE (*Poultry Sci.*, 21 (1942), No. 3, pp. 256-259).—Supplementing diets with massive doses of vitamin D, ascorbic acid, or hesperidin (a source of vitamin P which prevented vascular permeability), had no effect on the hemorrhagic syndrome manifested by chicks on a ration deplete in the antihemorrhagic factor. The results did not seem to rule out the possibility that increased fragility or permeability of the blood vessels of vitamin K-deficient chicks is not due to a lack of some factor other than vitamin K. Evidently the hesperidin had no

³ Biochem. Jour., 17 (1923), No. 2, pp. 286-293.

effect on the hemorrhagic condition manifested in cases of severe vitamin K depletion.

Vitamin K storage and prothrombin levels in chicks obtained from injected eggs, R. T. TIDRICK, F. W. STAMLER, F. T. JOYCE, and E. D. WARNER (*Soc. Expt. Biol. and Med. Proc.*, 47 (1941), No. 2, pp. 438-440, fig. 1).—In a study of the storage of vitamin K, experiments were conducted in which the synthetic vitamin (potassium 2-methyl-1,4-naphthohydroquinone disulfate) at 200- and 1,000- μ g. levels was injected into eggs prior to incubation. At hatching the chicks from these eggs and chicks from the uninjected control eggs were placed on a vitamin K-free diet, and prothrombin determinations were made on blood obtained from individual chicks bled at 3- to 6-day intervals. The blood findings, presented graphically, together with observations as to spontaneous hemorrhage in the chicks, showed that the injected vitamin protected against the rapid and extreme fall of the prothrombin level which occurred when chicks are placed on a vitamin K-free diet.

Gizzard lesions in day-old chickens, D. MILLER and H. W. TITUS. (U. S. D. A.). (*Poultry Sci.*, 21 (1942), No. 3, pp. 203-211, fig. 1).—In slightly more than 99 percent of 28,458 day-old chicks evidence of gizzard erosion was found. The average severity score of the gizzard lesions decreased more or less steadily during the first 6 days after hatching. A variety of feeds included in the rations of the parent stock and substances injected in the eggs at different stages of incubation had no influence on the incidence or severity of the gizzard lesions based on the extravasation of blood. "Apparently the presence of lesions in the gizzards of young chickens has little or no demonstrable effect on their growth."

Minerals in rations of battery brooder chicks, V. G. HELLER and R. PENQUITE. (Okla. Expt. Sta.). (*Poultry Sci.*, 21 (1942), No. 3, pp. 247-252).—A low calcium-phosphorus ration supplying less than 0.5 percent of each of these minerals was found which gave excellent growth in battery-fed chicks when 16.27 percent protein was fed. Casein was included in the ration and it was assumed responsible for the favorable growth and development of the chicks. Additions of calcium and phosphorus salts, singly and in combination, in different lots lowered growth and increased the malformations in the leg bones. Calcium supplements depressed the inorganic but not the organic phosphorus of the blood. It was also noted that high-phosphorus supplements reduced the inorganic calcium. Manganese may have value in assisting in the prevention of perosis by lessening the inhibiting effect of high mineral supplements, but it did not alter the blood constituents. These studies were based on determinations of the weights and defective leg bones of groups of 25 chicks each fed on a basal ration with supplements of buttermilk, casein, and minerals, singly and in combination.

Feed and other costs of producing market eggs, T. C. BYERLY (*Maryland Sta. Bul. A1* (1941), pp. 29, figs. 4).—The partition equation, $F = 0.523W^{0.403} \pm 1.126\Delta W + 1.135E$, was developed for a comparison of egg production and feed consumption of fowls of varying weights. The data were based on individual records of 102 laying hens, ranging in weight from 653 to 3,253 gm., and individually housed in cages from January to August 1940. In the equation F indicates the feed consumption per bird per day, W the body weight, ΔW changes in body weight, and E the weight of egg substance produced per day. Special arbitrary formulas were also developed for birds of the Leghorn and heavy breeds. Changes in body weights, feed consumption, and egg production must all be considered in establishing principles for general guidance. It was calculated that the feed requirements for maintenance without gain or loss in body weight ranged from 46.8 lb. for 3-lb. birds to 81.4 lb. per year for 7-lb. birds. For

each 100 standard weight eggs there were needed 14.2 lb. of feed above maintenance regardless of the weight of the hen. Thus, the maximum gross feed efficiency varied from 46.3 for 3-lb. birds to 84.3 percent for 7-lb. birds. The second part of the bulletin discusses the importance of various factors such as egg production, feed costs, overhead, mortality depreciation, and labor income from egg production in Maryland. Tables and graphs are included for use in calculating the effects of the major cost factors on net cost of producing market eggs.

Limited range for growing turkeys, T. T. MILBY and R. B. THOMPSON. (Okla. Expt. Sta.). (*Poultry Sci.*, 21 (1942), No. 3, pp. 243-246).—In 2-yr. experiments little difference was found between the gains of turkeys on Bermuda grass ranges limited to 25-40, 50-75, or 300-500 sq. ft. per bird and moved to fresh range at weekly intervals. A mash containing 20 percent protein and scratch feed of whole grains was made available. Growth was significantly retarded and feather pulling became prevalent in birds confined to 10-15 sq. ft. per bird. When those confined were given access to a small bare yard no differences in the rate of growth were noted from those having access to more ample range, but feed consumption per unit of gain was slightly greater. No differences in mortality could be attributed to the method of range management.

The vitamin D requirements of turkey poults, J. S. CARVER and M. RHIAN. (Wash. Expt. Sta.). (*Poultry Sci.*, 21 (1942), No. 3, pp. 260-262).—In studies with 20 lots of 15 poults each it was found that 80 or more A. O. A. C. chick units of vitamin D per 100 gm. of the ration were required to produce maximum growth and satisfactory calcification of the tibias. With smaller amounts of vitamin D, growth and ash contents of the tibias were reduced. These studies were conducted on the ash contents of the tibias of 10 duplicate groups of 15 poults each when different doses of fortified cod-liver oil were supplied.

The pigeon, W. M. LEVI (*Columba*, S. C.: R. L. Bryan Co., 1941, pp. XXXII+512, [pl. 1, figs. 784]).—A comprehensive account of the pigeon, including a description of the breeds and varieties, anatomy, physiology, and inheritance of color and morphological characters, with practical consideration of feeding, management, and diseases and parasites, is given. The different types, breeds, and genetic characteristics are briefly and completely illustrated.

DAIRY FARMING—DAIRYING

[Investigations with dairy cattle and dairy products in Illinois] (*Illinois Sta. Rpt.* 1938, pp. 140-149, figs. 3).—Results are briefly reported on the influence of rest periods for dairy cows on their subsequent milk production, by W. W. Yapp; the development of new feeding standards for milk cows and goats, by W. L. Gaines; the use of hybrid corns, soybeans, and alfalfa for silage and the returns secured from various types of dairy pastures, both by Yapp and W. B. Nevens; the bacterial population of ice cream, the relation of exposure time and temperature to effective destruction of bacteria in milk, and the value of resazurin for grading milk, all by J. M. Brannon and M. J. Prucha; and factors affecting the keeping quality of butter in cold storage, by O. R. Overman, O. F. Garrett, and H. A. Ruehe.

[Experiments with dairy cattle and dairy products in Pennsylvania] (*Pennsylvania Sta. Bul.* 414 (1941), pp. 6-8, 10-13, fig. 1).—Results are briefly reported for the following investigations: The economy of heavy grain feeding to dairy cattle, by A. A. Borland; the carotene requirements of dairy calves and the value of green hay in meeting this demand, by S. I. Bechdel and H. Keener; a milk cooling device involving motion of the milk cans along with agi-

tation of the cooling medium, by J. E. Nicholas; a comparison of various types of homogenizing machines for the homogenization of whole milk, by F. J. Doan; the factors involved in maintaining quality in frozen cream, by C. D. Dahle; the value of oat flour as an antioxidant in milk, by Dahle and D. V. Josephson; the use of calcium or sodium propionate or propionic acid for inhibiting mold growth in Cheddar cheese, by Dahle and F. G. Warren; and the value of manganese and iron salts in stimulating growth of certain types of bacteria which are desirable in dairy products, by T. G. Anderson.

[Experiments in dairying in South Dakota] (*South Dakota Sta. Rpt. 1941, pp. 25-34*).—Investigations, for which results are reported by T. M. Olson, G. C. Wallis, and D. H. Jacobsen, include sorghum-alfalfa silage v. corn silage for milking cows; the relative value of ground corn and ground sorghum grain in dairy rations; the influence of the fineness of grinding grains on their utilization by dairy cattle; flavors imparted to milk and butter by French weed, wild onion, and peppergrass; factors affecting the vitamin A and D content of roughages; the relative efficiency of Jersey and Holstein cattle in utilizing vitamin D in their rations; the vitamin D requirements of dairy cows; and the influence of various cream-holding methods on the quality of the resulting butter.

Feeding values of silages and hays: Grass and corn silages for cows, sun-cured and artificially dried hays [and] grass and corn silages for heifers, [and] hay and grass silage for heifers, O. M. CAMBURN, H. B. ELLENBERGER, and C. H. JONES (*Vermont Sta. Bul. 482 (1942), pp. 12*).—In a double reversal feeding experiment with milking cows, molasses-grass silage of relatively high moisture content was slightly, though not significantly, less efficient than corn silage, 1.81 and 1.87 lb. of 4-percent milk equivalent being produced per pound of total digestible nutrients consumed on the respective rations. Live weight gains were much the same in each case. In two trials, each of 120 days' duration, comparing sun-cured timothy hay, artificially dried timothy hay, timothy-molasses silage, and corn silage as sources of nutrients for growing heifers, 7.4, 6.8, 7.2, and 6.0 lb. of total digestible nutrients, respectively, were consumed per pound of gain. Timothy grass-phosphoric acid silage supplied nutrients for growing heifers somewhat more efficiently than sun-cured, slightly musty hay from the same source, the total digestible nutrients used per pound of live weight gain being 7.0 and 8.1 lb., respectively.

Silage without molasses, C. B. BENDER and H. B. SPRAGUE (*New Jersey Sta. Cir. 439 (1942), pp. [4]*).—Combinations of crops suitable for ensiling without preservatives and materials which may be substituted for molasses as preservatives are discussed.

Relation of ascorbic acid and of oxygen to oxidized flavor in milk, J. G. LEEDER and E. O. HERREID (*Vermont Sta. Bul. 481 (1942), pp. 12*).—Samples of mixed herd milk cooled and stored under varying conditions following pasteurization were observed for oxygen and ascorbic acid content and susceptibility to oxidized flavor development. Surface-cooled milks lost more ascorbic acid and developed more oxidized flavor than did those cooled in a pasteurizing vat. Partial evacuation and storage of milk under a vacuum decreased the rate of ascorbic acid and oxygen losses and greatly inhibited oxidized flavor development. Oxygen and ascorbic acid were not lost from milk in the theoretical 1:11 ratio, indicating that oxidizable constituents other than ascorbic acid are involved in the manifestation of oxidized flavor. The ascorbic acid content of milk was not significantly altered by changes from winter to summer feeding, but oxidized flavor occurred more often during the barn-feeding period. Milks frequently exhibited oxidized flavor even though ascorbic acid remained, while, on the other hand, milk containing little ascorbic acid at the end of a holding period, frequently showed no oxidized flavor.

VETERINARY MEDICINE

Animal pathology, R. A. RUNNELLS (*Ames, Iowa: Collegiate Press, Inc.*, [2. ed., rev.], 1941, pp. XIII+590, figs. 184).—A revised edition of this work (E. S. R., 80, p. 680).

[Work in animal pathology and parasitology by the Illinois Station] (*Illinois Sta. Rpt. 1938*, pp. 86-95, 105-108, 122-129, figs. 8).—Reporting upon the work of the year (E. S. R., 82, p. 678) by R. Graham, C. A. Brandly, G. L. Dunlap, J. Sampson, N. D. Levine, L. E. Boley, B. W. Fairbanks, H. H. Mitchell, and H. R. Hester, reference is made to Bang's disease; *Tritrichomonas foetus* as a possible cause of early abortion in herds; efficiency of chaulmoogra oil in the treatment of John's disease; control of ketosis in cattle and sheep; baby pig disease; commercially prepared antigen for control of pullorum disease; increase in incidence of respiratory diseases of chickens; use of developing chicken eggs for propagating viruses; poultry losses great despite disease-control progress; and trichomoniasis, a disease rare in chickens, found in two flocks in the State.

[Work in animal pathology and parasitology by the South Dakota Station] (*South Dakota Sta. Rpt. 1941*, pp. 7, 24, 34-39).—The work of the year (E. S. R., 84, p. 813) reported by C. J. Franzke, L. F. Fuhr, A. N. Hume, T. M. Olson, A. L. Moxon, H. D. Anderson, O. E. Olson, F. J. LeBlanc, G. Gross, T. Wright, and J. Watson relates to bloat in cattle, arsenic for prevention of selenium poisoning, chenopodium for eradication of worms in lambs, and an antidote for oat hay (nitrate) poisoning.

Veterinary anaesthesia, J. G. WRIGHT (*London: Baillière, Tindall & Cox*, 1942, pp. VII+207, pls. 7, figs. [48]).

The sulfanilamide group of drugs—a review, H. J. MILKS (*Cornell Vet.*, 32 (1942), No. 2, pp. 162-176).

Effects of sulfanilamide, sulfapyridine, sulfathiazole, and sulfanilylguanidine upon colon-typhoid-dysentery group, C. A. LAWRENCE and K. D. SPRAGUE (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 3, pp. 696-700).—In vitro studies of several sulfonamide derivatives, the details of which are given in tables, indicate that sulfathiazole and sodium sulfathiazole are somewhat more effective than sulfapyridine and distinctly superior to sulfanilamide and to sulfanilylguanidine against the colon-typhoid-dysentery group. Feeding the several compounds in the diet to mice caused, with a single exception, a significant reduction of the number of coliform organisms normally present in the intestinal excreta. Sulfanilamide, under the conditions of this test, proved to be ineffective in lowering the fecal *Bacillus coli* count of the animals.

The pathologic tissue changes produced by sulfathiazole and sulfathiazoline in rabbits, J. A. KOLMER, with tech. assistance of A. M. RULE and L. GROSIN (*Jour. Lab. and Clin. Med.*, 27 (1942), No. 8, pp. 1043-1046).—In the experimental work reported, the details of which are given in tables, both sulfathiazole and sulfathiazoline were found to be of low toxicity for rabbits by oral administration. "Doses of 0.05, 0.1, and 0.2 gm. per kilogram twice daily for 10 days in succession (20 doses) were well borne with no fatalities. Neither compound showed any macroscopic or microscopic evidences of injury of the meninges, brain, or spinal cord. In dose of 0.05 gm. per kilogram twice daily for 20 doses neither compound showed any gross or microscopic injuries of the kidneys, liver, or spleen. Both compounds in dose of 0.1 and 0.2 gm. per kilogram twice daily for 20 doses showed injury of the kidneys largely due to obstruction of the tubules by crystals of acetylated compounds, sometimes associated with tubular necrosis. These were the most frequent lesions observed. Both compounds were about the same in their production. Both

compounds in dose of 0.1 and 0.2 gm. per kilogram twice daily for 20 doses were about equal in the production of injury of the liver, usually expressed as cloudy swelling sometimes associated with slight fatty degeneration and necrosis of the peripheral cells of the lobules. Both compounds in dose of 0.1 and 0.2 gm. per kilogram twice daily for 20 doses were about equal in the production of injury of the spleen, usually expressed by slightly hyperplastic changes in the germinal centers of the Malpighian corpuscles."

The influence of storage on the chemical composition of nicotine sulphate and copper sulphate drench, M. C. FRANKLIN and R. F. POWNING (*Austral. Vet. Jour.*, 18 (1942), No. 2, pp. 72-75).—The experimental work reported has shown that a copper sulfate-nicotine sulfate drench deposits a sludge on standing which can be prevented through the use of suitable stabilizing agents. It is pointed out that the use of such stabilizing agents serves no useful purpose, since sludge formation has no significant effect on either nicotine or copper sulfate concentration of the solution.

Fern (*Notholaena sinuata* var. *crenata*) poisoning in sheep, goats, and cattle—the so-called "jimmies" of the Trans-Pecos, F. P. MATHEWS. (Coop. U. S. D. A.). (*Texas Sta. Bul.* 611 (1942), pp. 15, figs. 2).—The feeding upon cloak fern (*N. sinuata crenata*), which grows in crevices and under rocks in the drier hills and mountains from central Texas on west into southern California and south into northern Mexico, causes a toxication in sheep, goats, and cattle known as jimmies. The toxicosis is characterized by sudden seizures of severe trembling which may be followed by sudden death from respiratory paralysis, both of which are induced by exertion. The affected animals show no indication of a morbid condition while grazing, but fatalities frequently occur as a result of the animals being driven as little as 100 yd. It is pointed out that the term jimmies as applied to the disease here described has no relation to the same term sometimes used to designate rayless goldenrod poisoning. Since the greatest loss occurs in sheep and is due to the westward movement of this industry, it is becoming one of the leading disease problems for this class of livestock in the Trans-Pecos. The grazing of this plant causes a slight to moderate loss in goats but probably none in cattle. The effects of grazing the plant may appear as early as the middle of November. Mortalities begin the first part of January and continue until about 3 weeks after other green feed becomes available in the spring. In the experimental feeding of this fern to sheep and goats, evidence of toxicity was obtained by walking the animals not earlier than 48 hr. after receiving the first dose of the plant. Recovery from the toxic effects of the plant required from 5 to 19 days, a period which agrees with range observations. Infested pastures should be devoted to goat or cattle grazing, and if sheep are maintained in such areas the pastures should be small and no attempt made to work the sheep during the winter months.

Nitrate reduction in relation to oat hay poisoning, O. E. OLSON and A. L. MOXON. (S. Dak. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 100 (1942), No. 782, pp. 403-406, fig. 1).—The reduction of nitrates to nitrites in *Amaranthus retroflexus* (known as redroot) of high nitrate content was found to occur under varied conditions of temperature when the material is wet. The most rapid reduction occurs at temperatures around 40° C. and at pH levels between 7.0 and 8.0. *Bacillus subtilis* is thought to be the organism most important in the reduction.

Comparative study of meningopneumonitis virus, psittacosis of pigeon origin, and psittacosis of parrot origin, H. PINKERTON and V. MORAGUES (*Jour. Expt. Med.*, 75 (1942), No. 6, pp. 575-580).

Eimeria neoleporis n. sp., occurring naturally in the cottontail [*Sylvilagus floridanus mearnsii*] and transmissible to the tame rabbit, J. CANDIDO M. CARVALHO. (Iowa Expt. Sta. et al.). (*Iowa State Col. Jour. Sci.*, 16 (1942), No. 3, pp. 409-410, fig. 1).

A note on the examination of nose, throat, and vaginal swabs and of dung samples for the presence of *Str. agalactiae*, J. HARRISON (*Vet. Rec.*, 54 (1942), No. 4, p. 51).—Nose and throat swabs were taken from 74 cows, all but 6 of which had been proved by Edwards' technic (E. S. R., 71, p. 99) to be suffering from streptococcal mastitis or harboring the organisms in the milk. Vaginal swabs were taken from 20 virgin helpers and 56 cows, of which 15 were found to be harboring *Streptococcus agalactiae*. No Lancefield group B streptococci were isolated.

Control of contagious abortion by the area plan [in Ontario], J. S. WEBSTER (*Canad. Jour. Compar. Med. and Vet. Sci.*, 6 (1942), No. 5, pp. 143-147).

Allergy: A review of the literature of 1938, [1939, 1940, and 1941], F. M. RACKEMANN (*Arch. Int. Med.*, 63 (1939), No. 1, pp. 173-194; 65 (1940), No. 1, pp. 185-212; 67 (1941), No. 1, pp. 207-234; 69 (1942), No. 1, pp. 128-158).—A continuation of this annual review (E. S. R., 80, p. 101) of the literature on allergy covering the years 1938, 1939, 1940, and 1941, presented with 111, 137, 134, and 165 references, respectively.

Effect of dilution of neutral mixtures of eastern equine encephalomyelitis virus and antiserum, M. E. PIERCE, J. E. KEMPF, and M. H. SOULE (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 3, pp. 604-607).—Following a review, presented with a list of 22 references to the literature, work is reported in which a neutral mixture of eastern equine encephalomyelitis virus and homologous antiserum was reactivated when a 1:100 concentration of virus with antiserum was diluted a hundredfold with 0.85 percent saline solution and allowed to stand at 26° C. (room temperature). It appears that reactivation will occur only in a balanced mixture of virus and serum and, furthermore, the extent of dilution is important.

Significance of neutralizing antibody in experimental equine encephalomyelitis—a consideration of its relation to the disease in man: Preliminary report, R. W. SCHLESINGER, I. M. MORGAN, and P. K. OLITSKY (*Jour. Amer. Med. Assoc.*, 119 (1942), No. 8, pp. 618-620, fig. 1).—It was found in the work conducted that specific immunization of rabbits protects against an intracerebral test inoculation of equine encephalomyelitis virus only when the antibody in the serum reaches a titer of 1:300 or higher. At this level antibody becomes demonstrable in the cerebrospinal fluid, and this is believed to be an indicator of its availability to the central nervous system. It had already been shown that a low titer of serum antibody in vaccinated young mice was sufficient to indicate resistance to peripheral inoculation of this virus. Subcutaneous injection of active western virus in adult rabbits may lead to clinically inapparent virus invasion of the central nervous system, characterized by high fever and preceded by the presence of virus in the blood. Such infection of the nervous system takes place at a time when antibody is being produced. Deservescence and recovery set in as the antibody titer of serum reaches 1:300 (at about 5 to 6 days after injection). Young (4 weeks old) rabbits, similarly injected, die of encephalitis before this antibody level has been reached. Infection of man with equine encephalomyelitis virus and its possible prevention by vaccination are discussed in the light of experimental findings.

Human equine encephalomyelitis and St. Louis encephalitis in California, 1939-1941, B. F. HOWITT. (Univ. Calif.). (*Amer. Jour. Pub. Health*, 32 (1942), No. 5, pp. 503-515, figs. 3).—A study of encephalitis in California,

based largely on the serum neutralization tests, is summarized for the 3 yr. 1939, 1940, and 1941. Of 498 human serums from cases of neurotropic virus disease in the central valleys, including poliomyelitis, 213 neutralized the virus of western equine encephalomyelitis, 55 of 475 serums only the St. Louis strain, and 62 both viruses. If the total amounts for the 3 yr. are considered it is shown that 140 tests are positive only to the western equine virus, exclusive of those in combination with the St. Louis strain, as compared with only 55 for the latter virus alone. The work reported is in continuation of that previously noted (E. S. R., 86, p. 683). A list is given of 19 references to the literature cited.

Experimental transmission of Saint Louis encephalitis to white Swiss mice by *Dermacentor variabilis*, R. J. BLATTNER and F. M. HEYS (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 3, pp. 707-710).—In experimental work the virus of St. Louis encephalitis was recovered from the bodies of engorged larvae of the American dog tick which had fed on infected adult Swiss mice. Under experimental conditions the St. Louis encephalitis virus was transmitted to young Swiss mice by the larval ticks. Normal adult mice upon which infected full-grown ticks had fed developed considerable resistance to intracerebral inoculation of virus.

Suggestions for a mastitis control program for use by practicing veterinarians, W. D. POUNDEN (*North Amer. Vet.*, 23 (1942), No. 5, pp. 309-313, figs. 2).

Studies in rodent poliomyelitis, I, II (*Jour. Expt. Med.*, 75 (1942), No. 6, pp. 611-649, figs. 6).—In the first contribution presented (pp. 611-629) C. W. Jungeblut, M. Sanders, and R. R. Feiner report upon further experiments with the murine strain of SK poliomyelitis virus. The second contribution (pp. 631-649), by M. Sanders and C. W. Jungeblut, deals with the cultivation of the murine strain of SK poliomyelitis virus. It was found that the murine virus may be grown in embryonic mouse brain-serum ultrafiltrate cultures. The virus fails to grow in embryonic chick tissue cultures or in fertilized egg preparations.

Toxoplasma infection in animals, P. OLAFSON and W. S. MONLUX (*Cornell Vet.*, 32 (1942), No. 2, pp. 176-190, figs. 11).—Report is made of *Toxoplasma* infections in six animals, including a sheep, cat, and four dogs. The disease was characterized by a sudden onset, short course, high temperature, and marked depression. The characteristic lesion was a widespread conglutination necrosis attacking the intestine, lymph glands, liver, and lungs. Marked fibrinous exudation occurred in the necrotic areas. Pulmonary edema was a common lesion. In the cat, necrotic lesions were present in the intestine and mesenteric lymph glands, while the lungs showed marked epithelial hyperplasia (adenomallike lesion). The sheep showed a diffuse, nonsuppurative encephalomyelitis. *Toxoplasma* were readily demonstrable in the lesions from all cases, and the infection was experimentally transmitted from one dog to a puppy, from which it readily spread to other puppies kept in the same pen and produced fatal infections.

Parasitism in relation to the livestock industry of the South, B. SCHWARTZ. (U. S. D. A.). (*Sci. Mo.*, 54 (1942), No. 5, pp. 448-454).

The microscopic examination of incubated milk samples: Method and application in detecting infection of the bovine udder, A. L. KLECKNER (*North Amer. Vet.*, 23 (1942), No. 6, pp. 386-389).

Calf vaccination against Bang's disease—the essentials of a good plan for New York, R. R. BIRCH (*Cornell Vet.*, 32 (1942), No. 2, pp. 115-118).

The examination of colostrum and milk for the presence of *Brucella abortus* and its agglutinin, L. H. SCRIVNER. (Univ. Wyo.). (*Jour. Colo.-Wyo.*

Acad. Sci., 3 (1941), No. 1, p. 15).—An abstract of further work conducted (*E. S. R.*, 82, p. 388).

Studies on copper deficiency of cattle: The fatal termination ("falling disease"). H. W. BENNETTS, R. HARLEY, and S. T. EVANS (*Austral. Vet. Jour.*, 18 (1942), No. 2, pp. 50–63, figs. 5).—As a result of further experimental investigation and a more detailed study of the pathology, the authors are led to regard sudden death, referred to as falling disease, merely as the terminal manifestation of severe copper deficiency and not a separate disease entity. The primary lesion is starvation atrophy of the myocardium due to direct and indirect effects of copper deficiency, with replacement fibrosis. A fatal termination is a product of the extent and distribution of the heart lesion and of the effects of various stresses during the spring months. Death is ascribed either to ventricular fibrillation or to heart block, although the evidence here is very incomplete. The pathology of fatal and nonfatal cases of copper deficiency has been compared. The only difference encountered is the glomerular lesion characteristic of sudden death.

Diseases causing encephalitis in cattle, S. H. McNUTT. (Iowa State Col.). (*Cornell Vet.*, 32 (1942), No. 2, pp. 127–134).

Studies on ketosis in dairy cattle.—IV, The effect of glucose therapy and pasture feeding in cases of clinical ketosis, J. C. SHAW, R. C. POWELL, JR., and G. C. WHITE. ([Conn.] Storrs Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 100 (1942), No. 783, pp. 473–478, figs. 4).—A few typical cases which are believed to contribute to a better understanding of ketosis in cattle and more particularly of the antiketogenic effect of glucose in the treatment of that condition are presented.

Physiologic and metabolic aspects of acetonemia in cattle, M. H. ROEPKE. (Minn. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 100 (1942), No. 782, pp. 411–415).—It is pointed out that the large amounts of ketone bodies in the blood of animals showing ketosis should not be considered as toxic incomplete oxidation products of fat metabolism but as one of the normal means of utilization of fats for energy when sufficient carbohydrates are not available. Many high-producing dairy cows give a positive Ross test for urine ketone bodies during the winter months, whereas only a relatively small percentage of such cows show clinical symptoms of severe ketosis. The usefulness of the nitroprusside or Ross test for acetonemia may be greatly extended in cases where a positive test is obtained if it is repeated with a 1:10 dilution of the urine. Animals with a severe ketosis usually show a three or four plus reaction with a 1:10 dilution of urine. In this manner it is possible in most instances to distinguish between a mild or secondary ketosis and a severe or primary ketosis. The high ketone and low glucose levels of the blood in cases of severe ketosis indicate a carbohydrate deficiency and suggest the administration of liberal amounts of dextrose intravenously or orally.

A filterable virus from pneumonia and diarrhea of calves, J. A. BAKER (*Cornell Vet.*, 32 (1942), No. 2, pp. 202–204).—A filtrable agent was secured from cases of pneumonia and diarrhea of calves that produced a condition in mice similar to the natural disease. The transmission of the disease from calves inoculated intranasally with infected mouse lungs to normal calves by pen contact and the neutralization of the virus in mouse tests by serums from calves recovered from the natural disease further indicated that the virus came from calves. It is therefore concluded that an infectious pneumonia and diarrhea of calves is caused by a filtrable virus.

A further note on the incidence of *Trichomonas fetus* in slaughtered cattle from a Wisconsin abattoir, B. B. MORGAN and W. WISNICKY. (Wis

Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 100 (1942), No. 783, pp. 471-472).—In this further report (E. S. R., 86, p. 827) on *Trichomonas*, the incidence of *T. foetus* in 1,577 bovine uteri, all obtained from the same source, is noted. Only 2 of the pregnant group of 997 were positive for trichomonads. Thirteen positive cases of trichomoniasis were found among the 100 pyometras of the nonpregnant group of 580 uteri. Approximately 1 percent of the total slaughtered cows examined were positive for trichomonads. Examination of 211 bulls from the local packing plant failed to reveal any trichomonad infections.

Sulfanilamide affects normal cows unfavorably (*Pennsylvania Sta. Bul.* 414 (1941), p. 28).—Brief reference is made by A. K. Anderson to the effect of this drug upon normal cows.

The host specificity of sheep and cattle helminths, with particular reference to the use of cattle in cleansing sheep pastures, F. H. S. ROBERTS (*Austral. Vet. Jour.*, 18 (1942), No. 1, pp. 19-27, fig. 1).—With a view to determining whether cattle could be employed with safety to cleanse sheep pastures of helminths under a system of rotation, 7 of 14 species infesting the lambs previously grazed on a pasture on which five worm-free calves were afterwards placed were transferred to the calves. These were *Haemonchus contortus*, *Trichostrongylus colubriformis*, *T. axei*, *Strongyloides papillosus*, *Cooperia curticei*, *Trichuris parvispiculum*, and *Moniezia expansa*. The species which did not appear in the calves included *Oesophagostomum circumcincta*, *O. trifurcata*, *Trichostrongylus vitrinus*, *T. rugatus*, *Bunostomum phlebotomum*, *O. columbianum*, and *Dictyocaulus filaria*. All calves exhibited a resistance to infestation by *H. contortus* from sheep. After grazing for 6 weeks on a heavily contaminated pasture they exhibited only moderate infestations, and these, moreover, were rapidly eliminated. Attempts at reinfestation with larvae from sheep even after single passage through cattle, resulted at most in the establishment of only very small numbers of worms which could not maintain themselves. Calves which proved insusceptible to larvae from sheep were readily infested with larvae of a pure cattle strain. *T. colubriformis* established itself in the calves in fairly large numbers, but the infestations did not persist. *T. axei* occurred in the calves in only very small numbers, and these were gradually eliminated. The reactions of the calves to *C. curticei* were somewhat similar to those against *H. contortus*. The infestations with *C. curticei*, however, were larger and persisted longer. From field evidence it is believed, however, that *C. curticei* can persist in cattle for long periods only in the presence of sheep. Very heavy infestations of *S. papillosus* were rapidly acquired by all calves and then almost as rapidly disappeared. The short persistence of mature *M. expansa* in the two calves which became infested may indicate that this cestode is not well adapted to cattle, an opinion supported by the rarity of *M. expansa* in cattle in Queensland. *Trichuris parvispiculum* from sheep is apparently fairly well adapted to cattle.

From the point of view of using cattle to control sheep helminths in Queensland, *H. contortus* and *Trichostrongylus colubriformis* are the principal species to be considered. Cattle, it is believed, could be used with advantage to cleanse sheep pastures of *T. colubriformis*, providing the animals were permitted to remain in the pasture for some months. In the case of *H. contortus*, however, such a procedure would be dangerous because (1) low grade infestations may be set up in cattle, particularly young cattle exposed to *H. contortus* from sheep, (2) sheep are readily susceptible to larvae from sheep after passage through cattle, and (3) sheep may be easily infested with larvae of a pure cattle strain. It is also possible that in time the sheep strain may gradually adapt itself to cattle.

Field trials of control measures for parasitic diseases of sheep, W. E. SWALES, in collab. with P. E. SYLVESTRE and S. B. WILLIAMS (*Canad. Jour. Res.*, 20 (1942), No. 5, Sect. D, pp. 115-132).—Description is given of field tests of methods of helminth parasite control through anthelmintic medication of sheep flocks on the ranges, conducted during the years 1937, 1938, 1940, and 1941. Following the development of phenothiazine in 1939 as a practical and highly effective anthelmintic for sheep, medication of adult sheep before the pasturing season was found very effective in preventing nodular worm infections in lambs. One early spring treatment in 1940 and a similar one in 1941 reduced the incidence of nodular disease lesions to 0.65 per lamb, a reduction from the figures of 1938 of 99.1 percent in the lambs slaughtered in the autumn. In spite of no treatment of the lambs during 1940 and 1941, *Haemonchus*, *Monodontus*, and *Cooperia* were reduced to very low numbers, and no significant increase in other genera occurred. It is suggested that *Oesophagostomum* has been reduced to a level too low for subsequent recovery in these flocks unless it is reintroduced in new stock; thus this parasite can be considered as probably eradicated.

The effect of phenothiazine-salt mixtures on the development of parasite larvae in the feces of sheep, R. T. HABERMANN and D. A. SHORE. (U. S. D. A.). (*North Amer. Vet.*, 23 (1942), No. 5, pp. 318-321).—Phenothiazine-salt mixtures offered to sheep in the proportions of 1:9 to 1:14 were effective in stopping the development of parasite larvae in the feces when the quantity consumed daily contained at least 0.5 gm. or more of the drug. The development of the larvae in the feces was arrested in 48 hr. after the administration of phenothiazine. It is pointed out that during the summer months, when the salt consumption of sheep is greatest, phenothiazine-salt mixtures of 1:9 to 1:14 concentration may be of value in controlling pasture contamination and thereby reduce the infection of animals grazing on pasture.

Treating pregnant ewes with phenothiazine, R. T. HABERMANN, A. O. FOSTER and O. J. HUMMON. (U. S. D. A.). (*North Amer. Vet.*, 23 (1942), No. 6, pp. 390-393, fig. 1).—The experiments described and those reported by others indicate that phenothiazine is well tolerated by pregnant ewes. The findings show that the commercially pure chemical can be administered at a dosage rate of 25 gm. in the feed without risk to either the ewes or their lambs. It is pointed out that this makes it practicable to employ phenothiazine as a valuable adjunct to parasite control by removing the parasites during the winter in order to reduce contamination of spring pastures.

Pining in sheep.—II, Confirmatory experiments on its control by cobalt-rich fertilizers, J. STEWART, R. L. MITCHELL, and A. B. STEWART (*Empire Jour. Expt. Agr.*, 10 (1942), No. 37, pp. 57-60).—Further work here reported (E. S. R., 86, p. 389) has led to the conclusion that on farms where pinning in sheep is due to cobalt deficiency the increase in live weight and general improvement in the condition of lambs is sufficient to warrant top dressing with cobalt-rich fertilizers. However, "pinning" symptoms may be due to several causes other than cobalt deficiency.

Some diseases of feedlot lambs, F. THORP, JR. (Mich. Expt. Sta.). (*Cornell Vet.*, 32 (1942), No. 2, pp. 119-126).

A note on the occurrence in Australia of *Corynebacterium equi* in pigs, I. W. McDONALD (*Austral. Jour. Expt. Biol. and Med. Sci.*, 22 (1942), No. 1, pp. 27-29).—Report is made of the isolation of an organism, apparently identical with *C. equi*, from lesions resembling tuberculosis in the lymph glands of pigs.

Studies on anemia in dogs due to pyridoxine deficiency, J. M. MCKIBBIN, A. E. SCHAEFER, D. V. FROST, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 142 (1942), No. 1, pp. 77-84, fig. 1).—The experimental studies

reported have shown that blood plasma iron is abnormally high in anemia due to pyridoxine deficiency in dogs. It drops to a low normal level during the remission with pyridoxine therapy. Total blood copper values are at a low normal level during the anemia and increase to normal during pyridoxine therapy. Following the immediate stimulation in blood formation afforded by pyridoxine therapy, there is a lag which may be overcome by addition of liver extract to the ration. This stimulation is apparently not due to thiamin, riboflavin, nicotinic acid, pantothenic acid, or choline.

Chastek paralysis in foxes—B₁ avitaminosis induced by feeding fish, R. G. GREEN, C. A. EVANS, W. E. CARLSON, and F. S. SWALE. (Univ. Minn. et al.). (*Jour. Amer. Vet. Med. Assoc.*, 100 (1942), No. 782, pp. 394-402, figs. 3).—This contribution relates to work, an earlier account of which has been noted (E. S. R., 86, p. 534).

Distemper studies in ferrets.—I, Attempted conversion of a virus strain from a viscerotropic to a neurotropic form, L. M. HEATH (*Canad. Jour. Compar. Med. and Vet. Sci.*, 6 (1942), No. 5, pp. 125-129).—In the work conducted a fixed viscerotropic strain of distemper virus was modified by serial intracerebral passage so that it manifested purely neural symptoms in 6 and mixed visceroneural symptoms in 4 of the 10 passages made intracerebrally. Parallel subcutaneous passages on the other hand indicated that only 3 of the passages manifested any neural symptoms and these were mixed, while the remaining 7 were purely visceral.

An analysis of thirty thousand autopsies on chickens, H. A. HOFFMAN and D. E. STOVER (*Calif. Dept. Agr. Bul.*, 31 (1942), No. 1, pp. 7-30, figs. 44).—The results of autopsies on more than 30,000 chickens, made during a period of 10 yr. and which resulted in 17,071 diagnoses, are reported, the data being presented in graphs.

Nutritional diseases of poultry, C. D. LEE. (Iowa State Col.). (*North Amer. Vet.*, 23 (1942), No. 6, pp. 394-400, figs. 7).

The effect of the rearing environment upon the incidence of avian leucosis complex, C. W. BARBER (*Cornell Vet.*, 32 (1942), No. 2, pp. 194-202, figs. 2).—A high incidence of avian leucosis complex lesions was observed over a period of years among birds reared at the experiment station of the New York State Veterinary College. Of three groups of birds reared off the station grounds for 19 to 22 weeks, 0, 6.3, and 12.5 percent, respectively, were affected with the complex in contrast to 23 and 51 percent of the two groups of nonisolated controls. Birds isolated for periods of 4, 10, 19, and 22 weeks developed the complex to the extent of 46, 32, 13, and 10 percent, respectively, during a 400-day period. On the other hand, there was an incidence of 64 percent among the birds reared at the station. Birds that were raised in isolation environment developed the leucosis lesions much later in life than those reared at the station.

Newcastle disease in Victoria, H. E. ALBISTON and C. J. R. GORRIE (*Austral. Vet. Jour.*, 18 (1942), No. 2, pp. 75-79, figs. 4).—Description is given of two outbreaks of Newcastle disease which occurred in Victoria in 1930 and 1932. Cross-immunity tests indicate that the Victorian virus is immunologically identical with the virus of Newcastle disease.

The removal of the fowl tapeworm *Raillietina cesticillus* by short periods of starvation, W. M. REID. (Kans. Expt. Sta. et al.). (*Poultry Sci.*, 21 (1942), No. 3, pp. 220-229, fig. 1).—Experimental data, together with the related technic employed in infecting chickens with the fowl tapeworm *R. cesticillus*, one of the most prevalent and difficult tapeworms to control, are presented. It was found that starvation of a fowl infected with this tapeworm for 24 to 48 hr. results in the loss of the strobila of the worm which may pass out whole in the

feces or in partially digested chains of segments. This starvation effect produces results similar to those claimed for certain recommended worm treatments which prescribe a starvation period before medication. It was demonstrated that the scolex is not affected by long periods of starvation since in one case scoleces survived 20 days without food in the gut of the host. When normal feeding habits of the fowl were restored the neck was able to regenerate a new strobila and gravid proglottids were again produced in from 1 to 4 weeks. A sudden change in diet or removal to strange surroundings may induce voluntary starvation of the fowl which may result in the loss of strobilae. The feeding of oats did not cause worms to be eliminated. Starvation of the host immediately after the intake of mature cysticercoids does not prevent the establishment of some of these cysticercoids, although more than the usual number appear to be lost. Growth does not occur in newly established worms until after food is present in the gut. The long term cycles, in which occurs a cessation of proglottid production similar to the described starvation effect, are independent of the feeding habits of the host. The treatment of tapeworm-infected chickens to remove strobilae only for breaking, the life cycle cannot be recommended. Regeneration of new strobilae is too rapid and the length of life of the parasite is too long in both the larval and adult stages to make such a procedure practical.

A list is given of 29 references to the literature.

Poisoning of turkey poults from whorled milkweed (*Asclepias gallioides*), G. W. STILES. (U. S. D. A.). (*Poultry Sci.*, 21 (1942), No. 3, pp. 263-270, figs. 2).—The loss of 3-week-old poults that were turned into a small yard where young milkweed plants were growing led to field observations, supplemented by feeding experiments, which indicate that this milkweed is toxic for turkeys. With young turkeys fed 1 gm. of milkweed per 100 gm. of turkey weight, spasms followed within about 1 hr. and usually death in less than 5 hr. after feeding. Immature, tender plants appeared more toxic than more mature weeds. Whorled milkweed is found in southern Colorado, southwestern Kansas, northern New Mexico and Arizona, southern Utah, and possibly in southeastern Nevada, in northwestern Oklahoma, and the Panhandle of Texas. The economic importance pertaining to losses in turkeys from eating this milkweed may be a serious factor in localities where this plant thrives abundantly. Every effort should be made to provide wholesome green feed for turkeys and to eradicate the milkweed from premises known to be infested.

AGRICULTURAL ENGINEERING

Engineering in wartime agriculture, A. P. YERKES (*Agr. Engin.*, 23 (1942), No. 4, pp. 117-119, 125, figs. 2).—Pointing out the known wide discrepancies in labor requirements for unit crop production, the author proposes as an engineer's problem the development of a program of transferring inefficiently employed farm workers to jobs in war industries or other agricultural sections where they can render more effective service. He believes it probable that this could be done on a considerable scale without reducing agricultural production appreciably, if at all. Among causes of inefficient utilization of available labor and equipment, the farming of too small an area and the use of horses where tractors would be more efficient are cited. The author holds it to be possible to establish norms for all the various field operations. This would permit a quick totaling of the amount of work done on any given farm for which the acreage of each crop and the operations performed were known. The total per worker, obtained by dividing the total by the number of workers employed, should furnish a fairly accurate basis for comparing the relative efficiency of different farms so far as

crops are concerned. For illustrative purposes he uses the supposition that the basis for calculating the units for each field operation is the amount of work done with a two-plow tractor, believing that this might be as satisfactory a base as could be found since it represents a size of power unit most commonly used and on which there is probably the greatest amount of information available.

Land, labor, machines—key factors in wartime agriculture, F. J. Zink (*Agr. Engin.*, 23 (1942), No. 3, pp. 77-78, fig. 1).—The supply of machines now on farms is reported as below normal. The tendency is to increase the amount of machines on farms to compensate for the low rate of replacement during the depression years and to replace workers lost from agriculture since 1935 to date, now amounting to 905,000 persons, or about 9 percent of the average number of persons employed in agriculture during 1941; and to put into practice measures of improved agricultural efficiency made possible by improved engineering design, changing agricultural practices, soil conservation, sanitary regulations for dairy and meat production, and livestock feeding efficiency, as well as for labor saving. The 1942 machinery quotas average about 80 to 85 percent of the 1940 production, a lower percentage than the 1941 output, while quotas for attachments and parts are somewhat higher to offset the reduced supplies of the new machines in 1942. It becomes the individual farmer's problem to increase the land efficiency, increase labor efficiency to offset men no longer available, and increase the efficiency and use of time-saving machinery. The responsibility of the agricultural engineering profession is indicated as that of contributing its knowledge of engineering efficiency as applied to the treatment of agricultural problems.

[**Agricultural engineering investigations by the Illinois Station**]. (Partly coop. Ill. Nat. Hist. Survey, U. S. D. A., et al.). (*Illinois Sta. Rpt. 1938*, pp. 234-261, figs. 3).—These include notes by E. W. Lehmann, A. L. Young, and R. R. Parks on an increase of nearly 5,000 kw.-hr. in the consumption of current on a rural line serving nine cooperating farmers; study of septic tank dimensions, by Lehmann and A. M. Buswell; viscosity after hard use as a key to value of lubricating oils, and rubber tires and high compression as a source of new life for tractors, both by R. I. Shaw; dependence of efficiency of terraces upon maintenance, by Lehmann, R. C. Hay, and El. L. Hansen; influence of field and crop conditions on use of smaller combines, by Young and S. M. Elliott; methods of growing and harvesting soybeans, by H. P. Bateman, Elliott, and Lehmann; killing of insects attacking stored grain by drying, by R. H. Reed and M. D. Farrar; factors affecting the quality of stored wheat, by T. Cleaver, W. Ashby, W. A. Foster, W. L. Burlison, G. H. Dungan, Farrar, and Lehmann; and lespedeza weed control through cleaning of seed, by C. W. Veach.

[**Agricultural engineering investigations by the Pennsylvania Station**] (*Pennsylvania Sta. Bul. 414* (1941), pp. 4-6, fig. 1).—A. W. Clyde reports on an increase of plow draft due to parasitical friction, apparently greater in moldboard than in disk plows, and on adaptation of a field gun recoil mechanism principle to an automatic tractor release hitch, called a stop-hitch, to prevent share breakage in plowing where heavy stones are encountered.

[**Agricultural engineering investigations by the South Dakota Station**] (*South Dakota Sta. Rpt. 1941*, pp. 65-69).—R. L. Patty reports on the comparative costs and the condition after 16 years' service of galvanized and painted steel fence posts, L. F. Larsen and Patty on conversion of horse machinery for tractor farming and on tests of new materials and methods for farm building floors, Patty and H. H. DeLong on continued experiments in the use of rammed earth walls, and DeLong and Larsen on prevention of mechanical injury to barley.

[Agricultural engineering investigations by the Wisconsin Station] (*Wisconsin Sta. Bul. 455 (1942), pp. 5-8, 21-22, figs. 3*).—This report notes an experiment by L. F. Graber and F. V. Buralow with a "quick haymaker" or roller crusher which picks up the hay as cut and crushes the stems between rollers, the mixed hay having dried to 14 percent 24 hr. after crushing but only to 29 percent moisture content when cut without crushing; and simple methods of building temporary or permanent pen barns, by S. Witzel, E. Helzer, E. Zehner, and A. Elneron.

Surface and underground waters of Ohio, W. STOUT, C. V. YOUNGQUIST, and R. E. LAMBORN (*Ohio Engin. Expt. Sta. Cir. 43 (1942), pp. [4]+20, figs. 16*).—This circular contains a foreword by Director C. E. MacQuigg, followed by discussions of (1) the conservation of Ohio's water resources, by Stout; (2) the surface waters of Ohio, by Youngquist; and (3) the underground waters of Ohio, by Stout and Lamborn.

The first of these discussions calls attention to the existence of a serious water supply problem in Ohio, with current average consumption per capita of from 80 to 100 gal., constantly increasing with increasing industrial demands, spread of irrigation, and other growing uses. Practicable ground water supplies occur mainly over former river valleys buried by glaciation. Only about one-half the area of the State has these resources. Utilization of about one-twentieth of the average run-off would meet current needs, but there is need to "practice every known method possible to put water back into the ground wherever it can be restored."

The second paper briefly discusses gaging and flow measurements, rainfall, and reservoirs. The last-named subject is especially emphasized from the viewpoints both of supply and of flood control. "Control will consist of the construction of large reservoirs for storing of excess flood waters for release during drought periods. The benefits of such a program over a long period will greatly outweigh the cost."

The third paper takes up the subjects of water from glacial deposits (the source of the greater part of the ground water available in Ohio) and water from deposits of stratified rock. This discussion is based largely upon the geological map of the State. The authors conclude that "more than one-half of Ohio is so physically constituted through a thick blanket of glacial drift or through porous rock strata at the surface that the supply of ground water is ample to meet the common needs of the farm, factory, or town." In the remainder of the State, however, the supply of ground water is generally meager and uncertain.

Profile curves for open-channel flow, D. F. GUNDER. (Colo. State Col.). (*Amer. Soc. Civ. Engin. Proc., 68 (1942), No. 4, pt. 1, pp. 535-542, fig. 1*).—The author analyzes certain irregularities appearing in the surface profile curves for gradually varied flow under conditions in which the depth of flow is less than both the normal and critical depths. The equation of gradually varied flow in a wide rectangular channel is integrated for the case in which the Chézy coefficient is given by the Manning relation $C = 1.486 \frac{R^{1/6}}{n}$. The curves for a variable Chézy coefficient given by the Manning relation are sketched. It is concluded, in part, that the use of the differential equation of gradually varied flow at depths below both the critical and normal depths should be restricted, in that the Manning relation for the Chézy coefficient should not be used, although in most cases, from a theoretical standpoint, the Bazin or Ganguillet-Kutter relations are satisfactory; and that "perhaps the backwater curves in most texts are based on certain qualitative features of the equation of grad-

ually carled flow, plus a knowledge on the part of the writers of what these curves should look like."

Forest lysimeter studies under hardwoods, H. A. LUNT (*Connecticut [New Haven] Sta. Bul. 449 (1941), pp. 515-572, figs. 17*).—In the spring of 1938 the equipment previously described (*E. S. R., 77, p. 753*) was moved to a hardwood stand where the study was continued for 2 yr. longer. The results of this portion of the work are here presented.

Taken together, the study under hardwoods and the previous study under red pine show that, under the conditions of the investigation the amount of nitrogen which is leached into the soil from the forest floor of a normal, fully stocked stand may vary from 4 or 5 up to 25 or 30 lb. per acre per year. Of this, from 5 to 40 percent may be in the nitrate form, from 12 to 40 ammonia nitrogen, and from 40 to 75 percent organic nitrogen. Other materials washed out of the A₀ horizon in a year's time are total solids 300-700 lb., of which about 45 to 70 percent was organic matter; calcium from 12 to 32 lb.; magnesium from 1 to 10; potassium from 12 to 25; sulfur from 12 to 20; iron from 0.5 to 5; silica from 2 to 10; and phosphorus 0.5 lb. The bulk of this material is either taken up by roots or fixed in the soil so that only a very small portion of it goes deeper than 4 in. Nitrogen transformation may continue into the early winter, and the concentration of nitrogen and other constituents is frequently as high in winter as it is the rest of the year.

Comparison of the hardwood findings with those in the red pine plantation indicate some differences in acidity and composition of the leachate, but since the two studies were not carried on simultaneously and the two stands were dissimilar as to age, soil types, and previous history of the land, it is held inadvisable to stress differences observed in the two investigations.

Distribution of corn yields on farm terraces on the Shelby soil, A. W. ZINGG and D. M. WHITT. (*Mo. Expt. Sta. coop. U. S. D. A.). (Agr. Engin., 23 (1942), No. 4, pp. 126, 128, fig. 1*).—Corn was contour-drilled on the terraces, the point rows being placed on the back slope of the ridge on the upper portion of the terrace interval. The horizontal position, total weight of corn, and average surface-soil depth of each drilled row of corn were determined. The corn yield per acre for each row was calculated, the area comprising the row length and one-half the distance between adjacent drill rows of corn being used. When point rows were encountered, the yield was combined with an adjacent full-length drill row and the area and the row position adjusted accordingly. A graph of the composite of the surface and subsoil profiles for the three terrace intervals is given, together with a composite of the yield data on the interval. The average yield of corn for the entire interval was 28.5 bu. per acre, the average depth of surface soil being 0.84 ft. The graph representing the relation of surface-soil depth to yield indicates that an average yield of 31.2 bu. per acre could be expected if the surface soil were distributed uniformly over the entire interval, assuming that the surface soil would have been held in place and its fertility maintained under the present cropping system without the support of terraces. Other studies at the station indicate, however, that neither the soil nor the fertility would be maintained on this field without this support.

Drainage and flood-control engineering, G. W. PICKELS (*New York and London: McGraw-Hill Book Co., 1941, 2. ed., [rev.], pp. XII+476, figs. 153*).—About 95 pages of the original book (*E. S. R., 55, p. 376*) have been replaced by 125 pages of new or revised material. In the chapter on precipitation, a table of data on 54 of the more important storms over the United States has been added, together with similar data for the New England storm of 1936 and the Ohio Valley storm of 1937, and other material has been added to this chapter.

Also enlarged or brought up to date are the chapters on flood run-off, stream discharge measurements, flow of water in open channels (new data bearing upon Kutter's n both for stream channels and for floodways), and flood prevention by reservoirs. Only the chapter on drainage law remains unaltered.

Drainage as a conservation practice, L. A. JONES. (U. S. D. A.). (*Agr. Engin.*, 23 (1942), No. 3, pp. 97-98, fig. 1).—Noting that few realize the extent to which drainage has been practiced in the United States, nor the acreage of wet, swamp, and overflowed land susceptible to development at reasonable cost which still remains, the author gives a brief history of the development of agricultural drainage in the United States, from the first recorded drainage law, enacted by the Massachusetts Colony in 1702, and the New York State general drainage act of 1804 to modern practice. The need for costly machinery to permit economical construction of large drainage improvements and the resultant organization of drainage districts financed by bond issues paid for by assessments are briefly dealt with, and the present status is indicated on the basis of the U. S. Census Bureau records of acreage in organized drainage areas and acreage requiring rehabilitation of drainage improvements before the land can be made to produce the crop yields its fertility warrants.

Technique of determining shearing strength of soils: Progress report of a special committee of the soil mechanics and foundations division on the technique of soil tests, B. K. HOUGH, JR. (*Amer. Soc. Civ. Engin. Proc.*, 68 (1942), No. 2, pp. 255-263, fig. 1).—The committee reports conclusions drawn in part from a questionnaire requesting from testing laboratories (1) a detailed description of the equipment used for shear testing, (2) an outline of testing procedure including sample preparation, and (3) an explanation of methods of interpreting or applying test data to practical problems. In part, the conclusions are that the double-shear device seems better suited to empirical comparisons of different soil types than to determination of the actual shearing strength of soils. Choice between the direct-shear and the triaxial-shear testing equipment in any practical work depends on the nature of the individual problem. For research, the triaxial equipment appears to be more satisfactory, an exception being the stabilometer, which has certain construction features making it more suitable for empirical tests than for research. No testing equipment can be considered entirely satisfactory, except for empirical tests, until the state of stress that it produces in the specimen is definitely known. Testing procedure must be varied to fit each problem. Efforts to determine the shearing strength of a given soil will be discontinued. The committee believes that in some cases in actual practice the necessary data on soil characteristics may be assumed by an experienced soils engineer without any tests at all, at least for preliminary design purposes, provided he has a clear conception of stress conditions in the prototype.

Stresses in a curved beam under loads normal to the plane of its axis, R. B. B. MOORMAN (*Iowa Engin. Expt. Stu. Bul.* 145 (1940), pp. 64, figs. 28).—This report presents algebraic analyses of (1) the stresses in a curved beam of any cross section in which there is little or no bending moment induced in planes parallel to the plane of the axis of the beam, and (2) the circular-arc beam of I cross section loaded by single concentrated loads, together with the load and deformation measurements for comparison with results obtained from each analysis. Load and deformation measurements were made on a curved round steel rod and a curved I beam. The rod was bent cold and tested unannealed. The I beam was bent cold and tested in both unannealed and annealed conditions.

The conclusions drawn are held to form a sound basis for the determination of structural strengths of horizontally curved beams subjected to vertical loads.

Machining and related characteristics of southern hardwoods, E. M. DAVIS. (Coop. Univ. Wis.). (*U. S. Dept. Agr., Tech. Bul. 824* (1942), pp. 42, pls. 14, figs. 6).—Four-ft. test boards were collected by the Forest Products Laboratory from different sawmills scattered from Virginia to Texas and compared, together with northern black walnut, Central American mahogany, and standard furniture woods. Separate tests for planing, shaping, turning, boring, mortising, and sanding, and for the related properties, steam bending, nail splitting, and screw splitting, covered 50 samples of each species in each test. The machining trials closely followed commercial practices. Numerous samples of each wood were measured for specific gravity, rings per inch, shrinkage, cross grain, warp, and minor imperfections. Data obtained on about 25 woods show that a given species may give good results in some operations, fair in others, and poor in still others. The general utility of a wood must be judged by summing up its properties. These are here reported in statistical form. Some woods are adaptable to several operations, but others require exacting technics for satisfactory results.

Preservative treatments of fence posts: 1941 progress report on the post farm, T. J. STARKER (*Oreg. Engin. Expt. Sta. Bul. 9-C* (1941), pp. 5).—This is the 1941 progress report on an endurance test set up in 1927.

Good practice in concrete masonry wall construction, K. C. TIPPY (*Jour. Amer. Concrete Inst., 13* (1942), No. 4, pp. 317-328, figs. 4).—The author discusses some of the concrete masonry wall construction details which represent the difference between ordinary and good construction, such as strength, durability, and watertightness; the need for preshrinkage of moisture-laden masonry units before laying in a wall; the use of the proper mortar; adequate footings and foundations; use of proper lintels and sills; tying of partitions to exterior walls; expansion and contraction joints; and precautions with parapet and flashings, drains, and waterproofing practice.

The effect of change in moisture-content of the creep of concrete under a sustained load, G. PICKETT (*Jour. Amer. Concrete Inst., 13* (1942), No. 4, pp. 333-355, figs. 17).—The amount and rate of plastic flow in concrete under load has been found to depend upon the rate of drying. This paper presents a mathematical analysis showing that this is a natural consequence of nonuniform shrinkage and a nonlinear stress-creep relationship. The analysis further shows that shrinkage cannot account for additional creep unless inelastic strain not proportional to stress is produced. Results from experiments designed to test the applicability of the theory to concrete are reported.

Saving steel in reinforced concrete design, R. L. BERTIN (*Jour. Amer. Concrete Inst., 13* (1942), No. 4, pp. 281-287).—The author proposes the prompt modification of the institute's Building Regulations for Reinforced Concrete, with reference especially to emergency construction for temporary use. He outlines a proposed emergency code and sums up its principles with respect to steel conservation as follows: "(1) Let the concrete do all the work it is capable of doing, (2) such reinforcement as is used should be high yield point steel, and (3) liberalize the working stresses to an extent consistent with a safe but not excessive factor of safety."

Proposed specification for cast stone, C. G. WALKER ET AL. (*Jour. Amer. Concrete Inst., 13* (1942), No. 4, pp. 313-315).—The principal changes which have been made are an increase in compressive strength requirements from 5,000 to 6,500 lb. per square inch and a reduction in permissible absorption from 7 to 6 percent. The absorption period has been increased from 24 to 48 hr., and the lower limit of 3 percent on absorption has been eliminated.

Building electrical equipment for the farm, W. A. ROSS, W. P. BEARD, J. DEISS, and L. C. PRICKETT (Fed. Security Agency, U. S. Off. Ed., Vocat. Div. Bul. 209 (1940), pp. V+97, [pl. 1], figs. 44).—This bulletin is planned to provide teachers of vocational agriculture with reliable subject matter organized in usable teaching form to facilitate systematic instruction on building safe and simple electrical equipment for the farm. It contains a foreword by J. C. Wright; hints on planning farm wiring, maintenance, and repair; and directions and drawings for the following 10 specific construction jobs: Making an electric poultry water warmer and an ultraviolet reflector for poultry; building an electric pig brooder, hotbed, and stock-tank water heater; rigging up a portable electric motor; assembling a motor dolly; building an electric chick brooder and pen; and making an exhaust fan room-cooling unit and a combination electric room-cooling and garden-irrigating device. A list of over 200 uses for electricity on the farm, some commonly used electrical terms and their meanings, and references on electricity are also included.

An insulated electric soil pasteurizer, A. HUSTULID. (Minn. Expt. Sta.). (Agr. Engin., 23 (1942), No. 4, pp. 127-128, figs. 5).—The author briefly describes a box-type pasteurizer of 0.5 cu. yd. capacity and of the inside dimensions 28 by 29 in. and 30 in. deep, with four immersed 750-w. heating elements. The device is mounted on trunnions supported by a frame of 3-in. channel iron. Soil temperature curves show the importance of suitable moisture content, the temperatures close to the heating elements reaching a maximum of 250° F. in a run with soil of a moisture content of 22.7 percent, whereas this maximum reached 500° in a soil of 6.6-percent moisture content. A moisture content such that the soil is ready for use was found convenient. In comparison with a box made from 1-in. pine, the insulated pasteurizer was found to effect a saving of about 0.15 kw.-hr. per cubic foot per 90° temperature rise.

Efficient use of farm production equipment, H. H. MUSSELMAN (Michigan Sta. Cir. 183 (1942), pp. 16, figs. 7).—This circular contains brief discussions of power and equipment resources, the individual nature of the problem of appraisal and analysis of resources for each farm, making the most of machinery, optimum loads for tractors, training for farm jobs, field work suitable for women, practicability of cooperation, costs involved in the use of farm machinery, machine capacity, the fitting of the machine to the job, and time-saving suggestions. The topic dealt with most fully is that of costs, under which head are taken up indirect costs, with some discussion of depreciation, life of machines, interest, repairs and obsolescence, and a shorter method of calculating indirect costs; direct costs and their estimation; use of cost estimation figures; and cost comparisons.

Mechanical injury in threshing barley, H. H. DELONG and A. J. SCHWANTES. (Minn. Expt. Sta. coop. S. Dak. State Col.). (Agr. Engin., 23 (1942), No. 3, pp. 99-101, figs. 6).—The speed at which the cylinders operated best ranged from 5,000 to 6,000 ft. per minute for all three types of cylinders. Slower speeds left unthreshed heads and higher speeds resulted in too much cracking and skinning. The best clearance for the rasp bar cylinder was from $\frac{3}{8}$ to $\frac{1}{2}$ in. as measured to the tips of the bar serrations. The rubber-faced bar did its best work at a $\frac{1}{4}$ to $\frac{3}{8}$ -in. clearance. The spike-toothed cylinder did its best work with a lateral clearance between teeth of $\frac{1}{2}$ in. The actual clearance cannot be changed materially, but by raising and lowering of concaves the areas of the tooth surfaces passing each other can be greatly altered. Minor changes can be effected by either cylinder speed or concave clearance, but for major changes in operating conditions it is necessary to adjust both speed and concave clearance. When the three cylinder types were carefully compared

as to their ability to thresh barley without cracking more than 3 or 4 percent, the test data showed that all three types can be (1) adjusted to thresh properly, (2) set to let heads go through unthreshed, or (3) set to thresh too severely and cause much mechanical injury to the kernels. It is believed that the rubber-faced bar cylinder has a slight advantage in threshing adequately without cracking the kernels.

A homemade castor bean thresher, H. P. CLAY (*Agr. Engin.*, 23 (1942), No. 4, p. 135, fig. 1).—The machine described consists of an old truck tire mounted on a front wheel and spindle. This tire turns inside a piece of tractor casing with adjustable clearance provided. The threshing is done between the inside of the piece of tractor casing and the outside of the truck tire. After being rubbed out between the tires, beans and chaff drop through an air blast which separates the chaff from the beans. The beans are then divided into two streams and dropped onto two separating rollers where the threshed beans are separated from the unthreshed beans. The separation of the threshed and unthreshed beans is accomplished by the separating rollers carrying the rough unthreshed beans over the top, while the smooth clean beans travel off the end of the roller. The unthreshed beans are rerun through the thresher. One hundred lb. of threshed beans per hour is about the capacity of the present machine. The limit in capacity is in the separating rollers. The tire has from 50 to 100 percent more threshing capacity than the separating rollers. Analysis of clean beans collected from the rollers revealed the following: Beans with cracked seed coat 0.4 percent, beans not hulled (i. e., not removed by separating rollers) 0.45, free hulls and foreign material, less than 0.1, and perfect beans 99.05 percent. As threshing cylinder, a 32 by 6 tire slightly inflated and best run at from 80 to 90 r. p. m., was used. The concave consisted of about one-fifth of a 9 by 36 tractor tire. A wooden fan and separating rollers were made. A $\frac{1}{2}$ -hp. motor furnished more than sufficient power. The device is shown in a photograph, but no drawings are included.

Mung bean production, L. E. HAZEN. (Okla. A. and M. Col.). (*Agr. Engin.*, 23 (1942), No. 3, p. 101).—The mung bean is more drought resistant than the soybean and easier to harvest than the cowpea. Of the two varieties now grown, the golden and the green, the latter seems to produce heavier yields of seed and to grow taller, making it readily adaptable to combine harvesting. Yields of seed range from 20 to 30 bu. per acre during favorable seasons on good ground. The forage yield is increased by sowing with the ordinary grain drill, but maximum seed production is obtained by drilling in rows with the corn planter, using a kafir plate.

In threshing, the concaves are removed but all teeth left on the cylinder. Some cracking occurs unless the speed is reduced, and as a full blast of air is required at the riddles, most threshermen merely remove the concaves and depend on aftercleaning to remove dust and cracked grain. The small size of the seed and its nearly spherical shape makes the fanning mill job simple.

Field shelling of corn, R. F. SKELTON and H. P. BATEMAN. (Univ. Ill.). (*Agr. Engin.*, 23 (1942), No. 4, pp. 131-133, fig. 1).—The picker-sheller used was a two-row, pull-type, rubber-tired machine equipped with a cylinder sheller and cleaner instead of the regular husking unit and a 40-bu. overhead grain tank. A 1936 model low-compression, rubber-tired tractor was used to operate the picker-sheller. Regular gasoline was used. The low-gear speed, approximately 3 miles per hour, was used. The crew consisted of two men, one operating the tractor and picker-sheller and the other hauling grain from the field in a truck.

The lower cost of the field-shelling method as compared to present methods for areas greater than 45 acres results from combining the picking and shelling operations, reduced hauling costs, greater capacity of the machine, and a smaller power requirement. The greatest portion of the harvesting losses in fields yielding up to 66 bu. per acre was caused by the snapping rolls and gathering points. The high moisture content of field corn during the harvest season and the lack of satisfactory storage or drying facilities at present necessitates that field-shelled corn be sold from the field at a low market grade. Foreign material and damage caused by the operation of the machine did not result in a reduction of market grade.

Some engineering phases of grain storage, H. J. BARRE and C. F. KELLY. (U. S. D. A. et al.). (*Agr. Engin.*, 23 (1942), No. 3, pp. 79-82, 84, figs. 3).—This is a discussion of work thus far completed in a project being carried on by the U. S. Department of Agriculture with the cooperation of various State agencies, much of the work here taken up having been earlier reported upon by Kelly (E. S. R., 83, p. 687; 86, pp. 397, 840), Long and Cropsey (E. S. R., 86, p. 101), Burkhardt (E. S. R., 86, p. 397), and Fenton (E. S. R., 87, p. 125).

The down-draft metal corncrib, D. H. MALCOM (*Agr. Engin.*, 23 (1942), No. 3, pp. 83-84, figs. 5).—In the design here sketched and briefly described the author faces the ventilator cowl into the wind, carries the down-draft nearly to the bottom of a cylindrical 16- to 18-ft. bin through a 1-ft. centrally placed vertical duct, and distributes it through perforations in a central drum 2.5 ft. in diameter. The bin proper is 10 ft. in height, exclusive of its dome roof. It is provided with a perforated metal floor and a drain pipe run out from the bottom of the central air-distributing drum. The principle of central introduction of the dry air is taken from the work of Kelly (E. S. R., 83, p. 687) with ventilated wheat storage. The down-draft ventilator proved superior in various experiments to ventilators of the suction type.

Alternative silo types to meet war demand for steel, J. R. MCCALMONT. (U. S. D. A.). (*Agr. Engin.*, 23 (1942), No. 3, p. 82).—The author tabulates the requirements of reinforcing and other steel and the nails and anchors for specified sizes of various temporary and permanent silo types. He points out that a good permanent silo may cost less in the end per ton of silage stored, because the cost is distributed over many years, but a temporary or less durable silo will pay dividends in increased milk or beef production by furnishing storage for the much-needed silage in this emergency period.

Handling and shipping tests with new potatoes from Kern County, California, W. R. BARGER, G. B. RAMSEY, R. L. PERRY, and J. H. MACGILLIVRAY. (Coop. U. S. D. A.). (*California Sta. Bul.* 664 (1942), pp. 24, figs. 11).—Shipping (to Chicago and New York) and holding tests were made in 1938, 1939, and 1941.

Most of the commercial stock from this district is washed and shipped in 100-lb. sacks. At the peak of the harvest (June), the temperature of the tubers when loaded is between 75° and 90° F. Stock dug and washed in the morning may be as much as from 10° to 15° cooler than that dug in the afternoon. Ventilated shipments in June have a temperature of from 65° to 70° en route, with a somewhat lower temperature while crossing the mountains. Refrigerated shipments cool under shippers' rule 240 (initial ice only) to a point between from 45° to 50° on the third or fourth day en route.

Potatoes in 100-lb. sacks were hydrocooled from 80° to 50° in 15 min. by passing through a shower of 35° water and were carried in perfect condition. A load was precooled with car fans from 80° to 45° in 6 hr., but wind from the fans caused surface browning. Severe surface discoloration (browning) of

skinned tubers was reduced by refrigeration and was practically eliminated for the 7-day transit period by precooling in ice water.

In a comparison of the effect of immediate icing of cars with that of delayed icing, less deterioration occurred with immediate cooling to 50°, even though the temperature rose after the fourth day. Poorer results were obtained by slow cooling in which tuber temperature of about 70° prevailed for 2 days followed by 50° for the remaining 5 days of the test. The sticky skin condition of tubers near the bunkers of cars under refrigeration appeared to develop during the first 3 days en route while the tubers are cooling slowly under humid conditions and to be eliminated by precooling the tubers in ice water. When tubers infected with late blight were shipped, the size of the lesions increased, but there was no spread of the disease to sound tubers, whether icing at the first icing station or delayed several days. Exposure to wind or hot soil soon after digging increased surface browning in transit. Browning was found to result from the combined effect of excessive drying and of oxidation of cells injured by skinning and is not immediately noticeable.

Cotton-gin maintenance, C. A. BENNETT and F. L. GERDES (*U. S. Dept. Agr. Leaflet 216 (1942), pp. 8, figs. 2*).—On the basis of work previously noted (E. S. R., 76, p. 856; 79, p. 404; 81, p. 119; 85, p. 545), this leaflet provides a general guide for repairing and modernizing ginning machinery. The topics specifically dealt with are checking pneumatic cotton-handling equipment; inspecting drying, cleaning, and feeding equipment; putting gin stands in shape; modernizing gin breasts; necessary attention to gin saws; testing lint-doffing systems; ginning bearings, belts, and pulleys; providing pure seed-handling equipment; inspecting lint-handling systems; checking kicker, tramper, and press; maintaining gin building; and care of the gin during the idle season.

Spraying equipment for pest control, O. C. FRENCH (*California Sta. Bul. 666 (1942), pp. 42, figs. 31*).—The author discusses sprayers and related equipment in considerable detail of design and operating characteristics, explaining the principles of the various devices, their comparative merits and limitations, effects of variation in the mode of operation, etc. Under the head of fundamental mechanics of sprayers are taken up atomization of spray liquid; pump types and their characteristics; pressure regulators; nozzles, guns, and rods; pressure and its effects; pressure losses in hose and rods; and agitation. The topic of portable power sprayers covers engine-powered, power-take-off, and traction-driven sprayers; sprayer tanks; transport trucks and wheel equipment; towers; and mixing plants and refilling equipment. Stationary spray plants are dealt with under the subheads object of the stationary system, pump and mixing plant, piping design, installation of pipe lines, rate of spraying, original cost of stationary systems, and advantages and limitations of stationary spray systems. Discussion of portable pipe line systems takes up objective of portable systems, the portable pipe line, methods of using portable pipe line systems, and merits and limitations of portable pipe line systems. The treatment of air atomizing sprayers includes development and use, types of equipment, and atomizing characteristics of air-type sprayers. Weed sprayers are considered with respect to requirements of equipment, pumps for weed sprayers, and booms and nozzles.

Time- and labor-saving equipment for the laying house, D. C. KENNARD and V. D. CHAMBERLIN (*Ohio Sta. Bmo. Bul. 216 (1942), pp. 89-96, figs. 7*).—The equipment described is to be made mostly from wood to meet the current scarcity of galvanized sheet metal. A mash feeder for layers is shown in a photograph and described briefly. A trough for drinking water designed to be placed in the partition between two laying-house pens and provided with

drainage arrangements to prevent drip and spatter from reaching the floor litter, as well as to permit flushing and cleaning, is shown in a photograph and in one cross section drawing. Box nests, of which each compartment accommodates from four to six layers, can be so constructed as to take up only half the wall space required by single nests of the same capacity. Drawings for the construction of 2- by 4-ft. units accompany the description. Ready-made and home-made catching crates are discussed briefly and illustrated, as are hinged panels for catching.

Rural fire prevention, H. GIESE. (Iowa Expt. Sta.). (*Agr. Engin.*, 23 (1942), No. 4, pp. 120-125, figs. 12).—On the basis of 50 years' records of 150 county mutual insurance organizations and of various other data concerning farm and town fires in Iowa, the author concludes that most of the fire waste on farms is in dwellings and barns. Much can be accomplished if flues and heating systems are in good shape and all hazardous roofs are protected by spark arresters on the chimneys. Well-rodded barns and careful management in haying will prevent barn fires. Dwelling fires occur mainly in winter, whereas most barn fires occur in the summer.

Old persons, above 60 yr., or young persons, below 10, are the most likely to be killed or injured by fire. The greatest number of deaths, injuries, and livestock losses from fire do not occur at the same time as the greatest fire waste nor from the same causes.

AGRICULTURAL ECONOMICS

[Proceedings of the thirty-second annual meeting of the American Farm Economic Association] (*Jour. Farm Econ.*, 24 (1942), No. 1, pp. 1-353).—Included are reports and the following papers, with discussions, presented at the meeting held at New York, N. Y., December 27-30, 1941: Adapting Agricultural Programs for War Needs, by S. E. Johnson (pp. 1-16) (U. S. D. A.); Agricultural Programs for the Post-War Period, by E. C. Young and J. C. Bottum (pp. 17-34) (Purdue Univ.); Canada-United States Trade Relationships, by D. A. Skelton (pp. 35-41); Latin American Aspects of Post-War Agricultural Readjustments, by F. A. Linville (pp. 42-51); Transitions to the Post-War Agricultural Economy, by J. D. Black (pp. 52-74); Private Enterprise and Conservation, by S. v. Ciriacy-Wantrup (pp. 75-96) (Univ. Calif.); Public Policy and Action for Conservation, by A. C. Bunce (pp. 97-108) (Iowa State Col. and U. S. D. A.); Society and Conservation, by C. H. Hammar (pp. 109-123) (Mo. Expt. Sta.); Problems in Physical Evaluation of Soil Conservation Benefits, by G. W. Collier (pp. 124-138) (U. S. D. A.); Needed Developments in the Evaluation of Soil Conservation Benefits, by N. W. Johnson (pp. 139-156) (U. S. D. A.); Behavior of Prices of Farm Products During World Wars I and II, by J. M. Tinley (pp. 157-167) (Univ. Calif.); The Land Market and Farm Mortgage Debts, 1917-1921, by L. J. Norton (pp. 168-177) (Univ. Ill.); Agricultural Labor in the First World War, by H. Schwartz (pp. 178-187); Nutritional Science and Agricultural Policy, by M. L. Wilson (pp. 188-205) (U. S. D. A.); Toward a More Adequate Approach to the Farm Tenure Program, by K. Brandt (pp. 206-225); The Content of Land Economics and Research Methods Adapted to Its Needs, by L. A. Salter, Jr. (pp. 226-255) (Univ. Wis.); Recent Regional Changes in Farming and Probable Future Trends, by R. L. Mighell, C. W. Crickman, H. L. Stewart, and K. L. Bachman (pp. 256-284) (U. S. D. A.); Agricultural Workers and Social Insurance, by J. J. Corson (pp. 285-295); Hired Farm Labor Under Minimum Wage and Maximum Hours Regulation, by E. L. Warren (pp. 296-314); Important Considerations in Determining a Fair Price for Fluid Milk, by A. MacLeod (pp. 315-319); The Effect of Milk Control Programs on Cooperatives, by C. G. McBride (pp. 320-325) (Ohio State

Univ.); Some Economic Problems Encountered in Milk Control Administration, by N. J. Cladakis and A. J. Pollard (pp. 326-332); Milk Control in Canada, by J. P. Nadeau (pp. 333-339); and Problems of Graduate Students in the Rural Social Sciences (pp. 340-342).

[Papers on agricultural economics] (*Jour. Farm Econ.*, 23 (1941), No. 4, pp. 697-872, figs. 5).—Included are the following papers: Foods for Defense, by J. B. Canning (pp. 697-711); Fundamental Elements in the Current Agricultural Situation, by J. D. Black (pp. 712-725); An Agricultural Policy for Hemisphere Defense, by F. A. Linville (pp. 726-742); Social Conflicts and Agricultural Programs, by K. H. Parsons (pp. 743-764) (Univ. Wis.); Training of Personnel for the Rural Social Sciences, by M. R. Benedict (pp. 765-770) (Univ. Calif.); Economics of Joint Costs in Agriculture, by S. v. Ciriacy-Wantrup (pp. 771-818) (Univ. Calif.); Conservation—An Objective or an Ideal? by N. W. Johnson (pp. 819-832) (U. S. D. A.); Recent Development Among Farm Labor Unions, by H. Schwartz (pp. 833-842); Shape of Total Revenue Curves, by A. Kozlik (pp. 843-854) (Iowa Expt. Sta.); Insurance Aspects of Extra-Risk Mortgage Loans, by D. C. Horton (pp. 855-866) (U. S. D. A.); and Development of "Normal" Citrus Fruit Yields by Tree Ages for Use in a Yield Insurance Plan, by R. R. Botts (pp. 867-872) (U. S. D. A.).

[Investigations in agricultural economics and farm management by the Illinois Station, 1937-38] (*Illinois Sta. Rpt. 1938*, pp. 175-208, 212-233, figs. 9).—In addition to results previously noted, these findings are included and discussed:

(1) A table by H. C. M. Case, M. L. Mosher, and W. A. Herrington summarizing the business records, 1935-37, of 200 farms in the Farm Bureau Farm Management Service in northern Illinois and those of the 40 most profitable and 40 least profitable farms; (2) chart, map, and tables by P. E. Johnston, J. B. Cunningham, Case, and M. P. Gehlbach summarizing by counties and groups of counties the business records for 1937 from 1,877 farms and comparing the records by years 1928-37 of farms in the Farm Bureau Farm Management Service in Livingston, McLean, Tazewell, and Woodford Counties; (3) findings by E. J. Working as to changes in farm income and the causes of such changes; (4) a statement as to income, indebtedness, expenditures for living, etc., of 117 farm families in 1937 as shown by a study made by Case, N. O. Thompson, L. Bane, and R. C. Freeman; (5) tables and chart by Johnston and Gehlbach showing the cost per crop acre by years, 1930-36, for different types of power, the changes in the type of power during the period, the number of horses and mules on Illinois accounting farms, 1926, 1932, and 1938, and the effect of size of farm and type of power on certain production costs; (6) the average harvesting costs per acre in 1937 with combines of different sizes and types, as found in a study by R. C. Ross and B. R. Hurt; (7) findings by Johnston and Gehlbach as to cost of husking and cribbing corn in 1937 with 66 pull-type and 30 mounted two-row mechanical corn pickers; (8) findings as to credit needs and opportunities of Illinois farmers by L. J. Norton (coop. U. S. D. A.); (9) some findings as to land use, living conditions, school administration, etc., and suggestions for readjustments in Pope County based on studies of welfare conditions by D. E. Lindstrom and of land use by V. B. Fielder (U. S. D. A.); (10) a chart by Working showing indexes of returns, 1921-37, per bushel of corn fed medium, good, and choice steers; (11) a statement by R. C. Ashby as to the number of cooperative livestock shipping associations active in the State in 1937 and the number of members and livestock handled by the associations; (12) findings by Ashby and E. N. Searls as to operating costs of trucks used in hauling livestock, charges per ton-mile and per 100 lb.,

earnings of operators, etc.; (13) findings by Ashby as to the operation of live-stock auctions, expenses of conducting sales, selling charges, etc.; (14) some findings by Norton as to the amount of grain shipped in 1937 from points on the Illinois River and the radius of operation of a large centralized elevator on the river in 1936; (15) tables by R. H. Wilcox, C. S. Rhode, and J. G. Cash showing the cost of milk production for 90 herds in 1936 and 99 herds in 1937 in northern Illinois and the costs and profits per cow (15 herds in 1937) as related to milk production per cow; (16) findings by R. W. Bartlett as to the effects of retail prices of milk and consumers' income, 1930-36, on the consumption of milk and the relation, 1921-37, of price spread between the retail prices of milk and evaporated milk and the per capita consumption of canned milk; (17) findings by Bartlett in a study of 13 creamery truck routes in 1937 as to the relation of volume of all dairy products and of butterfat hauled per mile to the cost of hauling per mile; (18) tables by Johnston and V. W. Kelley summarizing the production costs, 1937, in 24 apple and 17 peach orchards and spray costs, yields, and profits or loss in 23 apple orchards; (19) a statement by J. W. Lloyd and V. A. Ekstrom regarding the storage, methods of marketing, sales outlets, transportation used, etc., of 114 apple growers in 1937; and (20) tables by Wilcox and L. E. Card showing for 66 poultry flocks in 1937 the costs and returns from eggs according to the number produced per hen and the effect of hen mortality on cost of egg production.

[Investigations in agricultural economics by the Ohio Station] (*Ohio Sta. Bimo. Buls.* 215 (1942), pp. 81-82, 85; 216, pp. 96-100, 113).—In Bulletin 215 an article is presented by F. L. Morison on the cost of handling hay by different methods based on data from 167 farms in northwestern and north-central Ohio. Included in Bulletin 216 is an article, by G. F. Henning, on Some Effects of the War on Livestock Marketing and Stockmen based on a table giving the slaughter of hogs, cattle, calves, and sheep and lambs under Federal inspection by months in 1941 and the monthly averages during the period 1937-41.

The usual indexes of production, prices, and income, by J. I. Falconer, are brought down through December 1941 and February 1942, respectively.

Variability in wheat yields and outputs.—I, Cycles or random fluctuations, V. P. TIMOSHENKO (*Wheat Studies, Food Res. Inst. [Stanford Univ.],* 18 (1942), No. 7, pp. [2]+291-338, figs. 12).—Are fluctuations in wheat yields and outputs systematic in some respects and consequently predictable to a certain extent, or are they wholly dominated by chance? The answer is that many fortuitous factors, of which weather is perhaps the most important, dominate fluctuations in regional yields and outputs of wheat, at least to such an extent that, even with close statistical scrutiny, it is difficult to detect systematic tendencies. The usual analysis of series on wheat yields and production into component parts, however, reveals "cycles" with an average duration of about 3.5 yr. which recur less irregularly than cycles in business. Cycles of 3 or 4 yr. are also characteristic of fluctuations in other crops, and they are the most frequent in business cycles.

[Milk production costs in Pennsylvania], W. L. BARR (*Pennsylvania Sta. Bul.* 414 (1941), pp. 8-10, figs. 3).—The range in total cost of milk production, average costs of hauling and marketing milk, and average costs and returns per cow are given. The data are based on records kept by 79 farmers in 1938, 53 in 1939, and 74 in 1940.

Latin America as a source of strategic and other essential materials (*U. S. Tariff Comm. Rpt.* 144, 2. ser. (1941), pp. IX+397, pl. 1, figs. 30).—This is a report on the strategic and other essential materials and their production and trade, with special reference to the Latin-American countries and the United

States. "In the report there are presented basic data on production and trade for 40 selected strategic and other essential commodities which can or might be obtained in part or in whole from Latin America. For the satisfaction of its requirements for these products the United States is dependent, at least partially, upon imports. Not all of the commodities listed as strategic have been included, inasmuch as certain of them cannot be secured in Latin America. This is either because they do not exist there or because the technical equipment and skill necessary to produce them are not available. Other commodities, though not considered strategic, have been included because they are essential in the production of industrial and war equipment and of materials for Army and Navy personnel and for civilians. Still other commodities were added because they are important in the diet and health of the Nation."

Part 1, Mineral Products, includes 20 products. Part 2, Agricultural, Pastoral, and Forest Products, includes the following: Abacá, babassu nuts, cacao beans, castor-beans, cinchona bark, coconut oil, coffee, copra, unmanufactured cork, flax fiber, flaxseed, hemp fiber, henequen and sisal, hides and skins, jute fiber, kapok, palm oil, quebracho wood and extract, crude rubber, and wool.

Farm tenancy in the United States, 1940-1941: A selected list of references, L. O. BERGDAW (*U. S. Dept. Agr., Library List 2 (1942), pp. 49*).—This list of 255 selected references supplements Agricultural Economics Bibliography 85 (*E. S. R., 83, p. 554*).

Characteristics of farm property assessments in Maryland after the last reassessment, E. E. MILLER and W. P. WALKER (*Maryland Sta. Bul. A2 (1941), pp. 31-72, figs. 6*).—This is the second of a series of bulletins (*E. S. R., 84, p. 538*) designed to reveal farm assessment problems in the State before and after the reassessment made in 1937-39. It describes in considerable detail the assessment rates for different kinds of land and livestock after the reassessment, compares the rates between counties, and contains basic information for contrasting the results of assessing under a variable method of procedure and the absence of uniformity in unit values.

Land assessments represented from 50 to 65 percent of total real estate assessments in most of the counties, and buildings from 35 to 50 percent, averaging 58 and 42 percent, respectively. Assessments against farm dwellings varied from approximately one-half to two-thirds of the assessed valuation of the buildings and averaged about 55 percent. Farm dwellings accounted for nearly 25 percent of the total farm real estate assessment, varying from 17 to 35 percent among the counties. Approximately 81 percent of total land assessments were against tillable land and 10 percent against woodland. Livestock assessments averaged only 8 percent of the assessments against real estate, ranging from 2 to 15 percent in different counties. Rates of assessment on tillable land showed the greatest variation. Those on woodland showed more variation between counties but more uniformity within the counties. Inequalities of livestock assessments among individuals arose from a failure to make a complete assessment coverage and to apply variable rates on units of livestock classes.

Problems of packaging vegetables for upstate New York markets, H. PLATENIUS (*[New York] Cornell Sta. Bul. 779 (1942), pp. 19, figs. 4*).—The findings of a survey made during the summer of 1940 principally on the regional markets of Syracuse and Menands, the Niagara Frontier Market of Buffalo, and the municipal market of Rochester are presented and discussed. The findings as to containers used, packaging costs, and variability in net weight of packages are summarized. The functions of the regional markets, the factors determining choice of packages, and the variability in net weight of packages

are discussed, and recommendations are made for changes in packaging practices in general and for specific crops.

Grade and price comparisons of Del-Mar-Va and Virginia broilers and fryers, R. E. MAI and J. M. GWIN. (Md. Expt. Sta.). (*Poultry Sci.*, 21 (1942), No. 1, pp. 70-76, figs. 2).—"This study compares poultry produced and dressed on the Del-Mar-Va Peninsula, and the Valley of Virginia on a standard grade basis, and also gives the methods practiced in the marketing of Del-Mar-Va broilers. It also compares actual plant yields by grade from Del-Mar-Va and the Valley of Virginia with yields from middle western plants."

Effect of egg size and interior quality (as determined by candling) on egg prices, R. E. CRAY (*Ohio Sta. Bimo. Bul.* 215 (1942), pp. 76-81, figs. 5).—A table and chart show the average yearly premium per dozen paid for size and interior quality of eggs on the Wooster, Versailles, and Napoleon, Ohio, egg auctions, September 1, 1939-August 31, 1940. Charts show the seasonal variations on the Versailles auction during the same period. The relation of flock management to size and interior quality of eggs is discussed briefly. The average yearly premiums on the three auctions were: Large size over medium size—U. S. Extras, 4.6 ct., and U. S. Standards 3.5 ct.; and U. S. Extra quality over U. S. Standard quality—large eggs, 2.4 ct. and medium eggs 1.3 ct.

Crops and Markets, [April 1942] (*U. S. Dept. Agr., Crops and Markets*, 19 (1942), No. 4, pp. 85-104, figs. 2).—Included are crop and market reports of the usual type.

RURAL SOCIOLOGY

[Investigations in rural sociology by the Pennsylvania Station] (*Pennsylvania Sta. Bul.* 414 (1941), pp. 43-45).—The topics discussed include studies on the popularity of the Agricultural Adjustment Administration program, by P. I. Wrigley; the back to the country population movement, by H. R. Cottam; and poorly housed families as a social problem, by M. E. John.

Will history repeat in rural America? E. SCHMIDELER (*Rural Sociol.*, 6 (1941), No. 4, pp. 291-299).—Time and again in past history have lands become concentrated in the hands of a few owners, as in Rome under the Republic, Ancient Greece, and England, where the growth of large holdings began with the so-called "enclosure" of land for sheep raising, and even to this day the land is owned almost exclusively by a small handed-gentry. The system aimed at under the various Land Acts for the disposal of the public domain of the United States was the multiplication of small independent homesteads, but today the old homestead or family-size type of farm is being absorbed by the large-scale operator. The 1940 Census shows that a meager 1.6 percent of the farmers of the Nation—those farming 1,000 acres or more—now operate 34.3 per cent of all land in farms. Small farms—those of but a few acres—are also increasing, at least in number if not in total acreage, but the type of farm between these two extremes is losing its battle for existence. Outstanding among the causes of this change is the mechanization of agriculture. Little, if anything, is being done to check it or to offset its harmful effects.

Studies in the geography of population change, Canandaigua Lake region, New York, R. B. SIMPSON (*Rochester Acad. Sci. Proc.*, 8 (1942), No. 2-3, pp. 49-121, pls. 6, figs. 11).—The author describes and analyzes the changes in number and distribution of people inhabiting the Canandaigua Basin. Many similarities were found between the Indian occupance and that of the whites, even though the Indians were only one-tenth as numerous as their successors. Early Seneca history was marked by abandonment of the Allegheny Plateau in favor of the Ontario Plain, probably because of better agricultural conditions

on the lowland. Indian population had its periods of marked decline, although they were the result not so much of migration as of the Colonial Wars. At least one-half of the Senecas lived, as today almost half of the whites do, in a single village at the foot of Canandaigua Lake so large that if it were recreated it would rank as the third largest agglomeration in the region.

The density of rural population in the Canandaigua region is more than three times as great on level as on steep land, but differences in gradient are less important today than they were in 1860, thus running contrary to the general principle that, as civilization progresses, the returns from the farming of steeper lands diminish. This exception is the result of the spread of viticulture after 1860. The distribution of people throughout the Canandaigua Basin is a function of thickness of the A horizon of the soil and bears only slight relationship to the texture of that soil. Road condition has a direct effect upon population density. Those thoroughfares which are surfaced today have always had at least twice the population of those at present unsurfaced. As the pavement is actually applied, these differentials are increasing somewhat. The distance from the lake bears a direct relationship to population density, for the median distance of farms from Lake Canandaigua has been constantly declining throughout the region as a whole. The factors road type and distance from lake are increasing slightly in importance, while the others remain static or decline somewhat. The principle of comparative advantage, operating in a region which has only limited physical assets in the usual sense of the term, holds both the explanation of the past and the key to the future.

Population movements influenced by fertility of soil (*Illinois Sta. Rpt. 1938, pp. 208-210*).—An incompleting study by D. E. Lindstrom indicated that ownership and income varied directly with soil fertility, whereas tenancy varied inversely.

Growth of population in Kentucky, 1860-1940, H. W. BEERS (*Kentucky Sta. Bul. 422 (1942), pp. 24, figs. 12*).—The author found that the trend of population in Kentucky was generally upward during the entire period from 1860 to 1940, with many minor differences in subregions and counties.

A camera report on El Cerrito, a typical Spanish-American community in New Mexico, I. RUSINOW (*U. S. Dept. Agr., Misc. Pub. 479 (1942), pp. [4]+136, figs. 81*).—This camera report on El Cerrito, N. Mex., is the first of six to be published by the Bureau of Agricultural Economics. Each deals with a community typical of an area or group in the United States and is designed to serve as a companion book for a series of six technical publications. That for El Cerrito has been previously noted (*E. S. R., 86, p. 697*).

Contemporary sociological research in farm family living, O. D. DUNCAN. (Okla. A. and M. Col.). (*Rural Sociol., 6 (1941), No. 4, pp. 300-310*).—It is stated that the great majority of family budget, or standards of living, studies which have been conducted in this country are neo-Engelian in character, although Zimmermann has succeeded in turning attention to a literal interpretation of Engel's Law and in bringing the original Le Play studies to a position of prominence in the United States. Most of our budgetary studies have adopted features of Wright's version of Engel's Law, traits of the original study by Engel, and characteristics of Le Play, but recently the technics of correlation analysis have been grafted upon the older Engelian approaches. Budgetary patterns are now being used as independent rather than as dependent variables, while the Wright-Engel approach has been modified almost indefinitely. Multiple factor indexes and scales of measurement are being perfected which give promise of producing radical changes in budgetary analysis.

Some sociological aspects of consumers' cooperation, L. C. KERCHER (*Rural Sociol.*, 6 (1941), No. 4, pp. 311-322).—This study of the Finnish-initiated consumers' cooperative movement in the North Central States demonstrates that a nexus of sociological factors conditions the successful initiation, development, and functioning of cooperative enterprise. These factors represent several major areas of sociological interest: Regional economic and ecological organization, population migration and settlement, cultural heritage and change, social aspects of personality, group organization and interaction, community structure, and institutional organization and functioning. Since every cooperative situation is in some respects unique, conclusions or generalizations drawn from the study of one cooperative situation must, of course, be applied with understanding and insight to another.

Cultural change and the country weekly, C. F. REUSS. (Wash. State Col.). (*Rural Sociol.*, 6 (1941), No. 4, pp. 332-338).—This article describes some adaptations made by the small-town newspapers in Washington to the social and cultural changes occurring in the rural environment. Among these adjustments are: A stability in numbers which has been reached at the expense of some loss of per capita circulation strength; a reduction in the number of two-newspaper towns; an increase in the size of the newspaper page; a shift from Saturday to Thursday as the second most important day of publication; a decreased interest in political parties and policies; and a concentration on local news, particularly of persons and organizations. These trends suggest certain observations on the process of change and adaptation in social institutions, which by nature are slow to change: Adjustment to change is forced upon an institution by the inroads of competing agencies; the stimulus to change comes from without, not from within the institution; and changes in any one of the four elements of any institution—rank and file membership, leadership, physical structure and equipment, and pattern of attitudes lending sanction to the operation of the institution—will evoke changes and adaptations in the structure and functions of the institution.

Rural youth in Indiana (18-28 years of age), L. ROBERTSON, H. F. AINSWORTH, O. E. BAKER, and N. T. FRAME (Coop. U. S. D. A.). (*Indiana Sta. Bul.* 467 (1942), pp. 47, figs. 40).—On the basis of interviews of more than 1,200 rural youth in five counties, the authors found that economic problems were the most important for rural young women, but social contacts were comparatively important, more so than for young men. Other needs reported included employment opportunities, getting started in farming, improved recreational and social opportunities, health, education, and religion.

Rural youth and the Government's recreation program, A. W. GREEN. (Univ. Conn.). (*Rural Sociol.*, 6 (1941), No. 4, pp. 323-331).—Of all segments in our population, rural youth perhaps stands most in need of the facilities and organization of the W. P. A. Division of Recreation, but because of a confusion of ends, and the way the machinery of the Division was set up, it has had to concentrate its efforts in urban districts. A number of weaknesses inherent in the Division's program are described, and these are concretized by the inclusion of a personal-experience document secured from a Division worker.

FOODS—HUMAN NUTRITION

[Studies in foods and nutrition by the Illinois Station] (*Illinois Sta. Rpt.* 1938, pp. 136-139, 299-311, fig. 1).—Among these studies are freezing in relation to palatability of meat, by S. Woodruff, S. Bull, and E. R. Rogosheski (pp. 136-139); factors affecting the carotene content of corn, by J. Outhouse and

E. Kempster (pp. 299-301); and the cake-baking characteristics of flours from Illinois wheats, by E. Chambers and Woodruff (pp. 307-308).

[Nutrition studies of the Pennsylvania Station] (*Pennsylvania Sta. Bul.* 414 (1941), pp. 27-28).—This progress report notes studies by N. B. Guerrant and R. A. Dutcher on the effect of exercise on the vitamin requirements of rats and on the nutritive factors involved in the development of achromotrichia in rats.

Estimation of the proximate principles of food in a few edibles by chemical methods, K. MITRA and H. C. MITTRA (*Indian Jour. Med. Res.*, 29 (1941), No. 2, pp. 315-323).—Data on proximate constituents and Ca and P, determined by A. O. A. C. methods, are reported for 13 kinds of grain foods, 18 of flesh foods, 27 of fruits, 13 of vegetables, and 9 of miscellaneous foods as consumed in Bihar Province. The foods are identified by local, English, and Latin names.

Balanced diets.—II, Studies on the nutritive value of fish, S. P. NIYOGI, V. N. PATWARDHAN, B. N. ACHARYA, and R. G. CHITRE (*Indian Jour. Med. Res.*, 29 (1941), No. 2, pp. 279-285).—Moisture, protein, fat, Ca, P, and Fe were determined, by methods noted, in the edible portion (proportion given) of 13 kinds of dried and 5 kinds of fresh fish obtained on the Bengal market. The liver oils of some of these fish were found to be several times richer than cod-liver oil in vitamin A content. The body fats did not contain vitamin A in appreciable amounts.

Nature's garden for victory and peace, G. W. CARVER (*Alabama Tuskegee Sta. Bul.* 43 (1942), pp. 18, figs. 9).—Edible wild plants commonly available in Alabama, classified by botanical families and designated by common and scientific names, are listed with brief descriptive notes and suggested methods of preparation for table use.

The effect of cooking on the nutritive value of vegetables, M. OLIVER (*Chem. and Indus.*, 60 (1941), No. 32, pp. 586-596, figs. 3).—This review, presented as an address, considers the effects of cooking on the various individual nutritive components in green leafy vegetables and in roots and tubers. The data presented include results obtained by the author in a study reported earlier (*E. S. R.*, 85, p. 570).

The Hamburgh parsley, S. DARK (*Nature [London]*, 148 (1941), No. 3744, p. 143).—This brief note concerns varieties, cultivation, and food value of this root vegetable. "The greatest merit of this vegetable as a wartime crop is its rich content of vitamin C which is available during the winter months. It has been found by a nutritional laboratory that roots which had been stored for 5 mo. still contained about 21 mg. of vitamin C per 100 gm., a much higher value than is known in any root vegetable except swedes."

Potato varieties: Sugar-forming characteristics of tubers in cold storage, and suitability for production of potato chips, F. E. DENNY and N. C. THORNTON (*Contrib. Boyce Thompson Inst.*, 12 (1941), No. 3, pp. 217-252, fig. 1).—The study reported earlier (*E. S. R.*, 85, p. 557) was continued with analyses of tubers of the 1940 crop and extended in that 14 varieties, in addition to the original 11, were studied; storage temperatures of 7° and 8.2° C. were introduced, in addition to the temperature of 5° (while tests at 10° were discontinued); storage was started at two different dates (October 25 and December 24) after harvest; and four (sometimes five) storage periods were employed, these varying from about 10, 17, or 18 days to as much as 144 days. In all, about 1,000 analyses for each of the two sugars were obtained, and potato chips were prepared from tubers sampled for sugar determinations.

The results, presented and discussed at length, confirmed the fact reported earlier that the concentration of reducing sugar and not that of sucrose deter-

mines the color of chips. Again it was found that tissue furnishing juice with more than 5 mg. of reducing sugar per cubic centimeter produced chips too dark brown in color and that the value should be as low as 3 mg. for a really satisfactory commercial color. Nine of the original 11 varieties showed nearly identical responses in the 2 yr. of test. Reducing sugar values of lots stored at 7° and at 8.2° were, respectively, only about 35 and 16 percent of the values at 5°. Delaying storage retarded the rate of increase of reducing sugar at 5°. At 7° storage temperature many of the varieties were kept at low reducing sugar values for periods of from 108 to 131 days after starting of storage. As far as sugar values were concerned 8.2° was also satisfactory, but sprouting was more extensive at that temperature.

Varieties of the Rural group (Neverblight, Russet Rural, Heavyweight, Carman No. 3, White Rural, Rural New Yorker, Number Nine, and Sir Walter Raleigh) and Chippewa and Blue Victor maintained low reducing sugar values during storage. Tubers of Chippewa sprouted readily, however, and soon became too soft for potato chip manufacture. Irish Cobbler proved satisfactory if storage was delayed until the late starting date, as tubers could then be held at 7° for at least 180 days without undue accumulation of reducing sugar. Tubers of Eureka, Green Mountain, Delaware, Bliss Triumph, Pride of Multnomah, Spaulding Rose, Blue Mercer, Warba, and Axtell Bugless attained high amounts of reducing sugars and were unsuitable for potato chip manufacture on account of the dark color of chips caused by this high sugar content. Sucrose values showed smaller differences than did the reducing sugar values upon storage at the three different temperatures. The order of varieties for increasing amounts of reducing sugar was not at all the order for increasing amounts of sucrose. "Tubers grown under different soil conditions with respect to added fertilizers and tubers of the same variety grown in two different localities showed no important differences in the amounts of reducing sugar developed during cold storage."

Effect of blanching on dehydrated vegetables, J. SUGIHARA, S. T. TSU, and W. V. CREUSS. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 21 (1941), No. 4, pp. 104-106, fig. 1).—Peas, beets, turnips, sweetpotatoes, cauliflower, and string beans were blanched for various lengths of time in water at different temperatures and in live steam and dehydrated at 140°-145° F. to a moisture content of 5 percent or less. Tests within a few weeks after dehydration showed that in nearly all cases the blanched products gave greater regains in weight with soaking and greater cooked weights than did the untreated products. In cooking tests with these and other dehydrated vegetables, the steam-blanched products were found superior in flavor and odor to those blanched in hot water. In most cases steam blanching to practically precook the vegetable (5-20 min.) was desirable, since this treatment gave a product that could be readily refreshed and quickly cooked.

Kind and variety of fruits and vegetables important in freezing (*South Dakota Sta. Rpt. 1941, p. 71*).—A progress report of work by M. Kellogg and E. M. Pierson with varieties adaptable to growing conditions in South Dakota.

Further studies on the retardation of the staling of bread by freezing, W. H. CATHCART (*Cereal Chem.*, 18 (1941), No. 6, pp. 771-777, fig. 1).—In a previous study (E. S. R., 82, p. 698) it was observed that bread frozen by sharp freezing methods developed an "off" aroma after about 40 days' storage at -22° or -35°C. To investigate the cause of this off aroma and to increase the length of time that the frozen bread could be kept fresh and salable several methods were employed. These included (1) quicker freezing, (2) variations in the bread formula by successive omission of one of the ingredients and by the use

of oat flour (in the formula or on the wrapping paper) as an antioxidant, and (3) hermetically sealing in the normal atmosphere and in vacuum, employing modern canning technic, before freezing.

The quickest freezing method employed, in which the unwrapped bread was frozen in a forced air tunnel at -35° , reduced the bread to a solid state in 60 min., halving the freezing time from that previously obtained but not, however, significantly increasing the keeping time for the bread. None of the variations in the formula lengthened the keeping time according to organoleptic tests, although the use of oat flour effected a slight lengthening of the keeping time according to peroxide values. Baking and subsequent canning prior to freezing greatly increased the keeping time, the breads remaining in good condition and salable up to 345 days; at 565 days there was some decrease in quality, although there was little evidence of the development of the off aroma. These results indicate that the off aroma is due in part to oxidation. It is pointed out that the canning and freezing of bread may prove of value in cases of emergency, although the lengthening of the keeping time is at present of no great importance in commercial production.

Nutritive value of agar and Irish moss, H. W. NILSON and J. W. SCHALLER (*Food Res.*, 6 (1941), No. 5, pp. 461-469).—Male albino rats with an average initial weight of 53 gm. were fed individually for a 10-week period on a control diet supplemented with 5, 10, 20, and 30 percent of prepared agar and 5, 10, and 20 percent of Irish moss refined for food purposes. In general, all the animals grew very well except those receiving the ration containing 20 percent Irish moss. These suffered a 50-percent mortality, and the survivors grew about 30 percent slower than animals of the control group. Rats fed the 20-percent agar diet gained about 20 percent faster than the control animals. Those fed the 10-percent agar diet and the 5- and 10-percent Irish moss diets required about the same amount of food per gram gain in weight as did the control group; more food was required by the other groups. Rats fed the 20- and 30-percent agar diets and the 10- and 20-percent Irish moss diets required significantly more water per gram gain in weight than did the control group. Apparent digestibilities of agar and Irish moss, calculated from intake and excretion (fecal) of nitrogen-free extract, were about 28 and 50 percent, respectively, irrespective of the level included in the diet. There was a statistically significant progressive depression in apparent digestibility of dry matter of the remainder of the diet as the level of agar or Irish moss increased. This depression amounted to about 10 percent with the higher dietary levels of agar and Irish moss.

Low-priced milk and the consumption of dairy products among low-income families, Washington, D. C., 1940, H. K. STIEBELING, S. F. ADELSON, and E. BLAKE (*U. S. Dept. Agr. Cir.* 645 (1942), pp. 28, fig. 1).—The consumption of fluid milk and other dairy products among selected groups of eligible low-income families was investigated during 1-week periods prior to and following the inauguration of the low-priced milk program. Of the families interviewed, 624 identical ones cooperated in both surveys by giving the information requested. In the preprogram period (May and June 1940) these families bought an average of 0.72 qt. of fluid milk per person per week and their consumption of milk in various forms—purchased and free—was equivalent in nonfat milk solids to 1.99 qt. of fluid milk per person per week. At the time of the second interview (October and November 1940) only 321 of the 624 families were participating in the program and of the participants only about one-half bought the maximum quantities allowed; more than one-fourth bought less than 75 percent of their allowance. The participants during the milk program survey were

buying an average of 2.65 qt. of fluid milk per person per week and the non-participants 0.54 qt. Consumption of milk in all forms, including purchased and free products, was equivalent in nonfat milk solids to 3.66 and 1.92 qt. per person per week among participants and nonparticipants, respectively.

On a per capita basis the Negro families bought more fluid milk and consumed somewhat more milk in all forms—purchased and free—than did the white families. The average quantities of milk in all forms, purchased and free, consumed by participating families after the low-priced program went into effect corresponded roughly to the quantities necessary for low-cost adequate diets including other foods wisely chosen for quantity and kind.

The dietary habits of college students, M. S. REYNOLDS, M. A. OHLSON, M. S. PITTMAN, H. MCKAY, M. B. PATTON, E. DONELSON, R. LEVERTON, E. J. MEILLER, and M. H. BITTING. (Wis., Ohio, Iowa, Kans., Minn., and Nebr. Stas.). (*Jour. Home Econ.*, 34 (1942), No. 6, pp. 379-384, fig. 1).—This is a report of an extensive survey made in 1936-40 as a part of the regional project of the North Central States relating to the nutritional status of college women. A total of 3,432 students distributed in the six cooperating institutions participated by keeping a 7-day record of the kinds and amounts in servings of food eaten.

Analysis of the records showed that meat was chosen most frequently by the largest number of students, while whole-grain products were least often selected. Next in popularity to meat was milk, followed by the green and yellow vegetables and the citrus fruit group. Only small differences appeared between freshmen and upperclassmen with regard to consumption of citrus fruits, whole grains, and meat, but about 18 percent more of the upper-class students reported the consumption of a green or yellow vegetable and of tea, coffee, or cola drinks on the average of once a day. The percentage of students consuming at least one cup of milk a day was 88 in the light-housekeeping group, 84 in residence halls, and 76 in homes and in cafeterias; for green and yellow vegetables, the percentages having at least one serving daily were 82 in organized groups and 66 in homes and in cafeterias. Daily consumption of citrus fruits (and also tomatoes) and whole-grain products was highest in light-housekeeping groups (64 and 66 percent, respectively) and lowest in the residence halls (23 and 32 percent, respectively). In residence halls 97 percent of the students had meat at least once a day, while in the light-housekeeping group only 77 percent of the students had meat daily.

Dietary requirements for fertility and lactation, XXVIII, XXIX, B. SURE. (Ark. Expt. Sta.). (*Jour. Nutr.*, 22 (1941), No. 5, pp. 491-498, 499-514).—In continuation of the series (E. S. R., 84, p. 420), two papers are presented.

XXVIII. *The lactation-promoting properties of cystine when added to casein diets.*—The original purpose of the studies here reported was to determine the lactation-promoting properties of various fats and oils, saturated and unsaturated, when fed at a 15-percent level with two types of salt mixture. The protein of the ration consisted of 17.7 percent of purified casein and 3.7 percent of protein in the dehydrated bakers' yeast used as a source of the B complex. Complete failure of these diets to meet the demands of lactation led to the discovery, based on reports of Daggs and coworkers (E. S. R., 80, p. 708), that cystine is a limiting factor. Fortification of the rations with 0.2 percent of cystine or administration of from 20 to 40 mg. of cystine daily to the lactating mothers resulted in successful lactation and weaning of the young. It is pointed out that these results "do not necessarily prove the essential nature of cystine, but do show that the lactation-promoting properties of a diet containing about 18 percent casein are markedly improved by the addition of this amino acid. Since casein contains

3.0 to 3.3 percent methionine, the rations provided about 0.6 percent of this amino acid, but apparently this amount is insufficient for rearing of young and supplementary cystine can meet the need for successful lactation."

XXIX. *The existence of a new dietary factor essential for lactation.*—On diets in which the vitamin B complex was supplied by pure thiamin, riboflavin, pyridoxin, choline, pantothenic acid, nicotinic acid, and the W factor from liver extracts in generous amounts, albino rats showed excellent growth but reproduction and lactation were abnormal. The use of a new salt mixture designated as Sure's salts No. 1, a modification of the one described by Phillips and Hart (*E. S. R.*, 75, p. 730), resulted in improvement in reproduction but failure in lactation. A rice-bran extract or a liver extract in amounts of 1 gm. daily, beginning at the time of breeding, resulted in successful lactation. On ashing the material negative results were obtained, showing that the factor was organic. Preliminary tests suggested that *p*-aminobenzoic acid and inositol may be components of the essential factor.

The influence of prenatal diet on the mother and child, J. H. FERRIS, F. F. TISDALL, and W. A. SCOTT (*Jour. Nutr.*, 22 (1941), No. 5, pp. 515-526).—Among women less than 6 mo. pregnant who were to be confined in the Toronto General Hospital, 400 with low incomes were studied through the prenatal period, and delivery, with observations on 250 of the babies to the age of 6 mo. After preliminary dietary records had been obtained, the subjects were placed in three groups, the members of one of which received their habitually poor diet without supplements, of another their poor diet supplemented to make up for its deficiencies, and a third a good diet obtained through instruction of the subjects with sufficient means to purchase such a diet.

"During the whole course of pregnancy the mothers on good or supplemented diet enjoyed better health, had fewer complications, and proved to be better obstetrical risks than those left on poor prenatal diets. The incidence of miscarriages, stillbirths, and premature births in the women on poor diets was much increased. The incidence of illness in the babies up to the age of 6 mo. and the number of deaths resulting from these illnesses were many times greater in the poor diet group."

The influence of previous regimes of protein feeding on the endogenous nitrogen metabolism of rats, R. B. FRENCH, J. I. ROUTH, and H. A. MATTELL, (*Jour. Nutr.*, 22 (1941), No. 4, pp. 383-389, fig. 1).—A chart is presented showing the average course of urinary nitrogen excretion (in milligrams per 100 gm. body weight) of young, adolescent, and mature rats placed on a nitrogen-poor diet following previous regimes with various levels of nitrogen intake. In young rats the course of endogenous nitrogen excretion was related to the previous dietary N, rats taken from the stock diet, for example, attaining a constant nitrogen output by the eighth day, while those taken from a high-protein diet had not attained a constant level even after 12 days. With older animals that had been subjected to repeated low-protein or nonprotein regimes interspersed with periods of realimentation, there was an overcompensation for the loss of body protein in these periods and an accumulation of unusual stores. As compared with controls such animals required a longer time on a low-protein diet before their urinary nitrogen fell to an acceptable endogenous level, and there was also a greater loss in body weight. This was particularly noted in maturing animals (100-200 gm. in weight) commonly used for such studies. With such animals, the use of short nonprotein feeding periods would lead to erroneous figures for the biological value of proteins. "Many of the studies on biological value may have been complicated by this unforeseen departure from the ordinary course of endogenous nitrogen excretion."

A study of the biological specificity of inositol, D. W. WOOLLEY (*Jour. Biol. Chem.*, 140 (1941), No. 2, pp. 461-466).—Several compounds closely related to inositol were tested for their activity as curative agents for alopecia in mice (E. S. R., 86, p. 714) and for their effect on yeast as determined by the method noted on page 476. Of the substances tested, *d*-inositol, *l*-inositol, pinitol, quebrachitol, and quercitol were inactive for both species; inositol hexacetate, phytin, and soybean cephalin effective for mice but not for yeast; mytilitol was active for mice and about 10 percent as active as inositol for yeast; and the mono- and tetraphosphates of inositol were 5 and 2 percent, respectively, as potent for yeast as inositol. These results are thought to indicate that only those compounds which can readily form inositol are active, while the naturally occurring isomers and those related compounds derived from inositol by substituting one or two hydrogen or hydroxyl groups with other radicals are inactive.

A study of the metabolism of ingested pectin, S. C. WERCH and A. C. IVY (*Amer. Jour. Diseases Children*, 62 (1941), No. 3, pp. 499-511, fig. 1).—In this extension of earlier studies (E. S. R., 87, p. 142), six male medical students served as subjects in an examination of the urine for galacturonic acid and both urine and feces for volatile fatty acids, particularly formic, during the third and fourth day of 4-day periods in which 30 gm. of pectin in gelatin capsules was added to a basal diet low in crude fiber.

In comparison with similar tests before the ingestion of pectin, the results showed no significant increase in the fecal and urinary excretion of volatile acids, particularly formic and acetic acids, and no galacturonic acid in the urine. "Hence, the favorable effects of a diet containing apple or pectin in the treatment of diarrhea cannot be ascribed to an improvement of the detoxicatory function of the liver as a result of the absorption of galacturonic acid. The favorable effects, according to our evidence, are exerted exogenously in the lumen of the bowel."

Phytic acid and the preparation of food, E. M. WIDDOWSON (*Nature [London]*, 148 (1941), No. 3747, pp. 219-220).—This brief report presents evidence to show that phytic acid in wheat suffers some destruction in cooking, due to the action of the enzyme phytase distributed in the flours. White flour, national wheat meal, and wheat meal, representing 70, 85, and 92 percent extraction, respectively, and containing 51, 127, and 214 mg. of phytic acid per 100 gm., showed 85, 69, and 31 percent reduction, respectively, in the phytic acid content when baked as yeast bread. Due to the difference in temperature and in pH, the reductions were much less when baking powder was used in place of the yeast; reductions were greater in products made of white flour with added sodium phytate than in products made of the phytic acid-rich wheat meals. This action of phytase would serve to lessen the extent to which phytic acid interferes with the absorption of calcium in human nutrition.

Low mineral diets and intestinal stasis, E. C. ROBERTSON (*Univ. Toronto Studies, Pathol. Ser.*, No. 9 (1938), pp. 76, figs. 15).—Evidence is presented at length to show that intestinal stasis developed in rats fed a diet very low but not absolutely deficient in minerals and otherwise adequate. These animals showed poorer absorption of water and protein than did controls on an entirely adequate diet. With increase in the K intake above that obtained from the mineral-deficient diet, the severity of the stasis was somewhat lessened, while with increase in Ca alone there was little stasis and with increase in Ca and K there was practically none. These results and others from trials with rats on diets deficient in Ca or K or both minerals showed that a low intake of Ca was necessary in rats for the production of intestinal stasis, while the effect of K was slight and evident only when the intake of all other minerals was low.

On the mineral-deficient diet or one from which Ca or Ca and K were omitted, the pH of the large intestine was about 6.0. Ca seemed to be the essential factor in keeping the pH about 7. Apprehensiveness, excitability, proptosis, polycythemia, dilatation of the lower intestine, and fast heart rates were observed in rats on the low-mineral diet. Since these are conditions occurring when the autonomic nervous system is stimulated, it is suggested that an imbalance in this system can be induced by means of diet alone.

In a group of 19 children receiving a diet furnishing only 0.2 gm. of Ca and 1.0 gm. of K, but otherwise adequate, 74 percent of them became definitely constipated, and after a barium meal 33 percent of them retained the barium in their appendixes for abnormally long periods. The same children fed the same diet adequately supplemented with Ca and K did not retain the barium in their appendixes more than 24 hr. "This suggests that a deficiency of the minerals, especially of Ca, may be one factor in the etiology of constipation and possibly in that of appendicitis."

Bone fractures due to low calcium diets, R. F. LIGHT and C. N. FREY (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 1, pp. 256-258, fig. 1).—Four litters of rabbits were divided at weaning into two groups, one of which was placed on a diet low in Ca (0.199 percent) but adequate in P (0.513 percent) and vitamin D (6.5 U. S. P. units per gram of ration), while the other half received this basal ration plus 1 percent of CaCO_3 . Eight of the nine animals from the former group died suddenly in from 3 to 8 weeks. Autopsy findings showed that one or more vertebrae had been fractured and collapsed in each instance, suggesting that vertebral fractures caused death in all cases. The control litter mates fed the basal diet plus the CaCO_3 showed no signs of paralysis throughout the experimental period, and X-rays showed well-developed normal vertebral columns. These results are considered to suggest that the paralysis observed by Boelter and Greenberg (*E. S. R.*, 86, p. 866) in their studies with rats on low-calcium rations was due to vertebral fractures and resulting compression of the spinal cord. Low-calcium intake is offered as an explanation of the cause of spontaneous vertebral fractures occurring in man.

The effect of calcium and phosphorus retention on nitrogen retention and vice versa, S. C. CHEN (*Chin. Jour. Physiol.*, 16 (1941), No. 3, pp. 303-307).—A study was made of the calcium, phosphorus, and nitrogen metabolism of young rats on diets containing about 12 percent of protein furnished as equal amounts of egg albumen and casein or as wheat gluten. Each of the two protein diets was fed at two levels of calcium intake, 0.1 and 0.4 percent, with the respective levels of phosphorus intake at 0.2 and 0.8 percent. At both levels of calcium and phosphorus intake the biological value of egg albumen plus casein was 86, indicating no influence on the biological value of a protein of good quality. The biological value of the gluten was 71 at the higher level of calcium and phosphorus intake and 65 at the lower level, suggesting a slightly favorable influence of calcium and phosphorus retention on protein retention. The percentage of calcium retention was not influenced by the quality of the protein, but the percentage of phosphorus retention was favorably influenced by a higher nitrogen retention.

Relation of calcium, phosphorus, and nitrogen retention to growth and osseous development, A. L. DANIELS (*Amer. Jour. Diseases Children*, 62 (1941), No. 2, pp. 279-294, figs. 3).—Retentions of calcium, phosphorus, and nitrogen, gains in height and weight, and changes in bone development as shown by roentgenograms of the hands and wristbones were followed in three preschool boys over a 9-mo. period. Although the boys were apparently well-nourished, the first roentgenograms indicated that they were skeletally retarded, with

skeletal ages from 6 mo. to 1 yr. 11 mo. below the chronological ages (Todd standard.) The diets fed throughout the study furnished from 53 to 76 mg. of Ca per kilogram of body weight per day, with from 75 to 78 percent supplied by a daily intake of 750 gm. of milk; from 56 to 81 mg. of P per kilogram; and 3.4 gm. of protein per kilogram daily during the first 7 mo. of the study and 2.6 gm. per kilogram during the last 2 mo. Milk, eggs, and meat furnished 80 percent of the protein. Skeletal ages were determined by four standards—those of Flory, Todd, and the fiftieth and ninetieth Harvard percentiles.

Calcium retentions over the several balance periods averaged 10.9, 10.0, and 11.3 mg. per kilogram for the three boys, respectively; phosphorus retentions 8.7, 8.2, and 7.9; and nitrogen retentions 57, 56, and 46 mg. per kilogram. These retentions, high at the beginning of the study, remained high and in some cases were even higher in the end periods than in the early periods. Decrease in the nitrogen ingestion did not influence nitrogen retention, indicating that the 2.6 gm. of protein per kilogram was sufficient for the average child of preschool age. The higher retentions were associated with gains in height in two cases and in weight in two cases and occurred during April, May, and June, when more time was spent out of doors. Over the period of the study the skeletal ages of the children tended to approach the normal by all standards.

The author had the technical assistance of G. J. Everson, M. F. Deardorff, O. E. Wright, and F. L. Scoular.

Magnesium needs of preschool children, A. L. DANIELS (*Amer. Jour. Diseases Children*, 62 (1941), No. 3, pp. 568-576).—This second report on the magnesium needs of children (*E. S. R.*, 76, p. 883) represents part of the study (noted above) of the growth, osseous development, and mineral metabolism of three preschool boys. Each metabolism period consisted of two consecutive 5-day balance periods preceded by a 6-day adjustment period, and in the course of the study the magnesium intakes, which came from the food alone, represented three different levels. As far as possible calcium ingestions were kept constant throughout the study. With magnesium ingestion between 11.8 and 14.5 mg. per kilogram of body weight, average retentions for the three boys were almost constant (from 0.9 to 1.3 mg. per kilogram), although there was considerable variation from period to period. With lower ingestions, between 10.4 and 11.4 mg. per kilogram, retentions varied between just positive and frankly negative. It is concluded, therefore, that 11.8 mg. per kilogram is the minimal amount that should be included in the diet of the child of preschool age, but that this level would not provide any appreciable margin of safety. Percentages of ingested magnesium excreted in the feces were consistent at all levels of intake, averaging between 63 and 71 percent. "The average calcium: magnesium retention ratios during periods of positive calcium and magnesium retention were fairly constant; retentions during individual balance periods, however, varied widely, and although the retention ratio of the averages corresponded to the calcium: magnesium ratios of rapidly growing tissues (human fetuses), there was not sufficient evidence to conclude that these two substances are metabolically dependent on each other." The author had the technical assistance of G. J. Everson and M. L. Cooper.

Magnesium balance studies with infants, C. F. SHUKERS, E. M. KNOTT, and F. W. SCHLUTZ (*Jour. Nutr.*, 22 (1941), No. 1, pp. 53-64, figs. 2).—Nine male infants less than 6 mo. old., and receiving milk formulas to which either corn sirup or honey was added with vitamin and mineral supplements, were studied for at least eight 5-day metabolism periods (separated by periods of from 3 to 7 days) in which total magnesium intake varied from 54.6 to 245.3 mg. per day with fecal losses and urinary excretion amounting to from 39.5 to 191.6 mg. and from 1.0

to 21.6 mg. per day, respectively. Retentions were similarly variable within the limits of —23.5 and 105.9 mg. per day. In 33 of the periods at levels of intake under 20 mg. per kilogram per day, the retentions averaged 1.42 mg. per kilogram, whereas in 44 periods with intakes between 20 and 35 mg. per kilogram per day the mean retention was 3.96 mg. per kilogram. Fecal excretion of the magnesium averaged about 80 percent of the intake, exceeding it in 6 periods and being less than 60 percent of it in only 9 periods. Urinary excretion of magnesium varied from 1.0 to 21.6 mg., with a mean of 10.5 mg. per day. Both fecal and urinary losses tended to vary with the intake, although there were numerous exceptions. No definite relationship was noted between (1) magnesium and calcium retentions, (2) fecal phosphorus excretion and magnesium content of the feces or magnesium retention, and (3) the level of vitamin D (0–1,000 International Units daily) and the magnitude of magnesium retention. Slightly better retentions were found with honey than with corn sirup, although the data were not conclusive, and variations with different types of milk were ascribed to the level of magnesium intake.

Manganese and the growth of lactic acid bacteria, D. W. WOOLLEY (*Jour. Biol. Chem.*, 140 (1941), No. 1. pp. 311–312).—Observations that certain natural products produced much more rapid growth of *Lactobacillus casei* than did optimal amounts of pantothenic acid led to an investigation to determine the nature of this growth factor not supplied by the basal medium. Malt sprouts, or an aqueous extract from them, served as the best source of the growth factor, which was found to be carried over into the ash and to have its activity destroyed by H₂S. "Trials of several metallic salts showed that manganese was the effective material. Salts of Cu, Pb, As, Sb, Sn, Hg, Bi, Cd, Tl, Fe, Zn, W, and Mo. (0.01γ to 100γ) were without effect or were inhibitory. . . . The effect of manganese was only upon the rate of growth and not on the extent. With manganese, growth and acid production were complete in 12 to 16 hr.; without it approximately 40 hours' incubation was required." *Escherichia coli* and hemolytic streptococci of groups A and D were not affected by manganese.

Histological studies of the tissues of rats fed a diet extremely low in zinc, R. H. FOLLIS, JR., H. G. DAY, and E. V. MCCOLLUM (*Jour. Nutr.*, 22 (1941), No. 3, pp. 223–237, pls. 2).—The present report deals with the pathological changes observed in rats on a diet extremely low in zinc content but adequate in other respects. The diet, previously described (E. S. R., 86, p. 273), furnished not more than 2–4 μg. of zinc per rat per day. Mothers of the two litters of test animals were restricted to the zinc-deficient diet when the young were 12 days old. Control animals taken at about 25 days of age and given this diet with zinc supplementation to the extent of 0.15 mg. of zinc per animal per day were normal with respect to growth, appearance, histology, and reproductive behavior. Growth in zinc-deficient rats became retarded after the first 2 or 3 weeks, the hair became sparser after from 3 to 5 weeks, and subcutaneous fat disappeared. After about 70 days alopecia accompanied by roughened, scaly skin developed in some of the animals. Microscopic examination of stained sections of various tissues indicated specific pathological changes in the esophagus of deficient animals and to a lesser extent changes in the buccal cavity and the skin, and, in a few animals, in the cornea. "The esophagus showed extreme parakeratosis with a thick layer of partially keratinized cells. The skin showed hyperkeratinization, thickening of the epidermis, and loss of hair follicles with persistence of the sebaceous glands. Secondary bacterial infection occurred later. The cornea of two animals showed vascularization and leucocytic infiltration similar to that which has been described in riboflavin

deficiency. These ocular changes may indicate that zinc deficiency impairs the absorption or utilization of riboflavin."

Iodine in nutrition (*New York: Iodine Ed. Bur., Inc., [1941], pp. [250]*).—A bibliography issued in loose-leaf, mimeographed form. The compilation is kept up to date with current supplements.

Reduction in experimental rat caries by fluorine, S. B. FINN and H. C. HODGE (*Jour. Nutr.*, 22 (1941), No. 3, pp. 255-266, figs. 6).—One hundred and thirty-five rats were divided into three groups at weaning, the groups being given, respectively, a cracked corn caries-producing diet, this diet with the substitution of commercial casein for the powdered whole milk, and the latter diet with the daily addition of 3 mg. of fluorine administered by pipette as a solution of KF. After 200 days on the diets, the animals were sacrificed and the jaws were examined for caries and fractures. Further examination involving repeated successive grinding and staining of teeth from the right jaw and preparation of ground, decalcified, stained sections of teeth from the left jaw gave evidence, respectively, as to the grades of fissure caries and the nature and progress of fissure lesions. The findings (tabulated), examined for statistical significance and discussed, indicated that there was little, if any, qualitative difference in the appearance of the fractures in the teeth of the fluorine-fed group as compared with the controls, and that all rats exhibited many fractured cusps. However, the rates fed fluorine developed only about half as many cavities, and these of smaller size, as compared with the controls not fed fluorine (1.1 and 3.5 cavities per rat, respectively). Thus, for each cusp involved in the fluorine group, there were 3.6 cusps involved in the casein-fed controls. Moreover, for each tooth destroyed in the fluorine-fed group, 4.2 teeth of the controls were destroyed. "The data given above lead to the hypothesis (1) that fluorine prevents the development of a carious lesion on the site of a fractured cusp, thus giving the caries-free mouths; and (2) that fluorine prevents the development of a small cavity into a larger one, thus giving the lesser number of cusps involved and whole teeth destroyed."

Effect of various dietary deficiencies on the periodontal tissues of the guinea-pig and of man, P. E. BOYLE (*Jour. Amer. Dent. Assoc.*, 28 (1941), No. 11, pp. 1788-1793, figs. 7).—In this address the effects of prolonged deficiencies of vitamins A, C, and D on the teeth and periodontal tissues are differentiated.

Photodynamic action and diseases caused by light, H. F. BLUM (*New York: Reinhold Pub. Corp., 1941, pp. XII+309, figs. 50*).—This book, covering an extensive literature, reviews the evidence and points of view presented by the different workers in the field, and relates material under the various phases to draw conclusions where possible or present hypotheses where the material is uncertain or fragmentary. Discussion of the various phases of photobiology is preceded by brief chapters on light and photochemistry treated in terms of the quantum concept. Photodynamic action and diseases produced by light in domestic animals and in man are discussed. It is pointed out that there are many laboratory examples of photodynamic action, but that authentic examples in nature are relatively few, although of considerable importance. Hypericium (St. Johnswort poisoning or Klamath disease), geeldikkop (yellow thickhead), and fagopyrism (buckwheat poisoning) in sheep are examples of such photodynamic action.

Consideration is given to abnormal sensitivity to light in man, the response of normal skin to light and the sunburn spectrum, abnormal sensitivity to the sunburn spectrum, abnormal response to blue and violet light, the photosensitizing action of porphyrins in man, effects of long exposure to sunlight and skin

cancer, photosensitization by substances coming into contact with the skin or applied internally, and other diseases attributed to the action of light, including the bronzing of the skin in pellagra.

Dark adaptation: Some physiologic and clinical considerations, J. MANDELBAUM (*Arch. Ophthalmol.*, 26 (1941), No. 2, pp. 203-239, figs. 9).—This paper discusses in considerable detail the measurement of dark adaptation; the physiology of dark adaptation; and clinical applications of the measurement of dark adaptation in vitamin A deficiency, retinitis pigmentosa, and glaucoma. The section on vitamin A deficiency includes a discussion of the interpretation of dark adaptation curves as indicating the state of vitamin A nutrition, the variability in response of individual subjects to a vitamin A-deficient diet and in recovery from a state of vitamin A deficiency, and disturbances in dark adaptation caused by diseases of metabolic origin.

Cure of spectacle eye condition in rats with biotin concentrates, E. NIELSEN and C. A. ELVEHJEM. (*Wis. Expt. Sta. et al.*). (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 1, pp. 349-352).—Evidence that the spectacle eye condition in rats described by various investigators is due to biotin deficiency is presented in detail and summarized as follows:

"The spectacle eye syndrome in rats has been produced very consistently by the inclusion of egg white in a synthetic diet which allows good growth in the absence of egg white. Pantothenic acid at levels up to 100 γ per day does not prevent the onset of this condition. Corn oil and pyridoxin or the combination of the two are without effect. Inositol has neither a preventative nor a curative action under these conditions. A biotin concentrate at a level of 2 γ of biotin per day is specific for the prevention and cure of this syndrome. The cure is first noticeable after 5 days, and complete restoration of the hair results after 2-3 weeks of treatment. A definite weight gain is noted with rats receiving the biotin concentrates."

The influence of chronic vitamin-A deficiency on the bacterial flora of rats, C. G. BURN, A. U. ORTEN, and A. H. SMITH (*Yale Jour. Biol. and Med.*, 14 (1941), No. 1, pp. 89-99).—This paper reports a comparison of the bacteriological findings in the mucosal surfaces and viscera of rats in a state of chronic vitamin A deficiency, controls with complete vitamin A deficiency, and normal controls.

During the year of observation, the rats in the chronic A deficiency group showed a progressive increase in the number of bacteria in the mucous membranes and tissues examined, and at the end of the year the findings were indistinguishable from those of acute vitamin A deficiency. In both chronic and acute deficiency there was a shift in the bacterial flora from a variety of organisms, few in number, to many colonies, chiefly *Staphylococcus aureus* and *Pseudomonas fluorescens*. In the animals with acute deficiency there was in addition a marked decrease in *Bacterium coli* in the intestinal flora.

One of the important differences between the animals in chronic and acute vitamin A deficiency was the absence in the former of widespread suppuration of the tissues. The minute quantities of vitamin A fed daily to this group not only controlled the infection, but prevented widespread distribution of the lesions. The staphylococcus was considered to be the organism of greatest etiological importance, with the other organisms as secondary invaders. However, none of the organs in which the organism was found showed gross or microscopic evidence of suppuration. The resistance induced by vitamin A is thought to be the result not of specific action on the toxic or on the invasive properties of the bacteria, but of nonspecific stimulation, the nature of which is not yet known.

Changes in the structure of the developing tooth in rats maintained on a diet deficient in vitamin A. C. G. BURN, A. U. ORTEN, and A. M. SMITH (*Yale Jour. Biol. and Med.*, 13 (1941), No. 6, pp. 817-830, pls. 3).—Essentially noted from a preliminary report (E. S. R., 78, p. 282).

Vitamins in dermatology (Rahway, N. J.: Merck & Co., 1942, pp. [2]+55).—Under date of March 1942, each of the known vitamins is reviewed as to physical and chemical properties, history, general and skin manifestations, and preventive and therapeutic dosage. Chapters are also included on unsaturated fatty acids, amino acids, and nomenclature. A bibliography of 191 titles is appended.

Seborrhoea and the B vitamins (*Brit. Med. Jour.*, No. 4203 (1941), pp. 124-125).—This editorial review, based chiefly on the work of György and associates, emphasizes the gross resemblance between the lesions of seborrhea in man and the scaly desquamations experimentally produced in the rat from a deficiency of pyridoxin, pantothenic acid, and riboflavin and by egg white injury. The view that excess of any of the three food constituents fat, protein, and carbohydrates has a causative relation to seborrhea is considered compatible with deficiencies of the above B vitamins as causal factors through the evidence of the interrelationship between proteins and biotin, fats and pyridoxin, and carbohydrates and riboflavin. It is suggested that "the relation of these various vitamins to seborrhea in man will have to be worked out by the controlled therapeutic administration of prepared concentrates or synthetic substitutes."

The pantothenic acid content of the blood of Mammalia. P. B. PEARSON. (Tex. Expt. Sta.). (*Jour. Biol. Chem.*, 140 (1941), No. 2, pp. 423-426).—The bacteriological method with the medium and organism described by Pennington et al. (E. S. R., 85, p. 442) was used in this study of the pantothenic acid content of whole blood, plasma, and cells of from 10 to 13 representatives of six animal species. Both sexes were used except in the human studies where the subjects were males. Except for rabbits, all of the subjects were adult. For whole blood the lowest average value, 19 ± 3.7 μ g. per 100 cc., was obtained with the human subjects, followed in increasing order by the dog, sheep, pig, horse, and young rabbit with a value of 71.7 ± 16.5 μ g. per 100 cc. For the plasma the lowest reading was again with the human subjects with a value of 17.0 ± 3.3 μ g. per 100 cc., followed by the other species in the order sheep, dog, pig, horse, and rabbit with a value of 57.8 ± 15.8 μ g. per 100 cc. In the horse, human being, rabbit, and sheep the content of pantothenic acid in the cells was greater than in the plasma, while in the other species the reverse was true. The value obtained for human cells was 23.6 ± 6.1 μ g. per 100 cc. Approximately 44 percent of the total pantothenic acid of the blood of the human subjects occurred in the plasma, while in the other species the amounts ranged from approximately 59 to 63 percent.

Relation of water metabolism to porphyrin incrustations in pantothenic acid-deficient rats. F. H. J. FIGGE and W. B. ATKINSON (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 1, pp. 112-114).—By controlling the water intake of rats on an unlimited, presumably adequate, stock diet, the authors have demonstrated that porphyrin incrustations on the nose and fur, identical with those which have been considered to be the most conspicuous sign of pantothenic acid deficiency, may be produced in normal rats by partial dehydration. This is thought to indicate that pantothenic acid may be involved in the regulation of water metabolism.

Rôle of para-aminobenzoic acid in vitamin B-complex studies with mice. G. J. MARTIN and S. ANSBACHER (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 1, pp. 118-120).—When a group of 75 black mice was fed a basal diet supple-

mented daily with several sources of the B complex vitamins—thiamin hydrochloride 25 μ g., riboflavin 50, pyridoxin hydrochloride 25, nicotinic acid 500, choline chloride 1,000, calcium pantothenate 250, and inositol 500 μ g.—75 percent of the animals showed graying of the fur in from 2 to 4 weeks, while in another group of the same number receiving as further supplement 250 μ g. daily of *p*-aminobenzoic acid the fur remained black during the 9-week test period. The omission of calcium pantothenate from the same diet for another group of 75 led to the development of signs of pantothenic acid deficiency in about 80 percent of the animals, and the omission of inositol alone to the development of typical alopecia in about 80 percent. When both inositol and *p*-aminobenzoic acid were omitted, alopecia did not develop. The authors conclude that "*p*-aminobenzoic acid has anti-gray hair activity in the nutritional achromotrichia of the mouse. It is a dietary factor necessary for the demonstration of the anti-alopecia effect of inositol."

Effect of adding vitamin B complex to the diets of stabilized diabetic children. R. L. JACKSON and I. BARTH (*Amer. Jour. Diseases Children*, 62 (1941), No. 3, pp. 516–520, figs. 2).—Five diabetic children under good control as to insulin requirement, freedom from glycosuria and clinically significant insulin shock, and normal diurnal blood sugar fluctuations from day to day were given for periods averaging 25 days 2 or 3 mg. daily of thiamin in vitamin B complex in addition to their regular controlled diet calculated to furnish from 1.07 to 1.8 mg. of thiamin daily. Two of the subjects were observed for another period, averaging 2 weeks, during which the supplement was not given. The blood sugar curves showed no significant change as a result of the additional amounts of vitamin B complex, thus indicating that the insulin requirement of diabetic children is not lessened by the consumption of vitamin B complex in amounts in excess of those obtainable in well-planned diets.

Studies in nicotine acid metabolism, I, II (*Jour. Nutr.*, 23 (1942), No. 1, pp. 23–45).—Two papers are presented.

I. *The fate of nicotinic acid in man*, H. P. Sarett, J. W. Huff, and W. A. Perlzweig (pp. 23–34).—In this study of the fate of nicotine acid in normal man under controlled dietary conditions before and after the administration of nicotinic acid derivatives, three series of experiments were run. (1) Three normal individuals were maintained on a control diet of trigonelline-free foods, and the levels of daily excretion of the acid hydrolyzable nicotinic acid fraction (NA) and trigonelline were determined by a slight modification (described in detail) of the method noted previously (*E. S. R.*, 86, p. 712) before and after test doses of nicotinic acid administered orally; (2) the urines of 33 medical students on various diets low in trigonelline and of 3 students who had fasted for 3 days were analyzed for NA and trigonelline; and (3) 6 normal young adults were given saturation tests with nicotinamide.

In (1) the excretion of trigonelline on the control diet free from sources of trigonelline ranged from 9 to 13 mg. daily and of NA from 1.1 to 1.5 mg. The trigonelline values were substantiated by values of from 8 to 12.6 mg. daily excreted by the 3 fasting individuals. Following test doses of 200 mg. of nicotinic acid taken on the third day, the added excretion of NA and trigonelline by the 36 subjects amounted during the 2-day period to 44 mg. of which from 55 to 84 percent was in the form of trigonelline and the remaining 16–45 percent nicotinic acid. The added excretion amounted to from 17 to 22 percent of the ingested dose. Of 200 mg. of nicotinamide taken on the ninth day, from 18 to 30 percent could be accounted for by the increased trigonelline excretion in the following 2 days, and there was no increase in NA fraction. Trigonelline ingested in 200-mg. doses was excreted to the extent of from 80 to 90 percent

and nicotinuric acid in 100-mg. doses to the extent of 56, 60, and 65 percent, with no increase in trigonelline. In (2) the daily excretion of NA ranged from 0.7 to 2.2 mg. and was not affected by smoking. In (3) the urinary excretion of NA and trigonelline by 6 subjects after six daily doses of 500 mg. accounted for from 27 to 42 percent of the ingested doses, with over 90 percent of the added excretion in the form of trigonelline. The authors conclude that "the extra excretion of NA and trigonelline after a test dose of nicotinamide may serve as an indication for the nutritional status of an individual with respect to nicotinic acid."

II. *The fate of nicotinic acid in normal and black tongue dogs*, H. P. Saret (pp. 35-45).—Studies similar to the above for man are reported for dogs, with essentially the same results. Trigonelline and nicotinuric acid were the end products of nicotinic acid metabolism in the dog's urine. The excretion of trigonelline fell to from 1.1 to 2.7 mg. per day on a low nicotinic acid diet and to 0.1 mg. in blacktongue. In both instances several 25-mg. doses of nicotinic acid were required before part of the dose was excreted. On higher nicotinic acid diets a total of about 7 mg. of the 12-15 mg. ingested daily was excreted, 90 percent of which was in the form of trigonelline. After saturation with nicotinic acid, 100-mg. doses were completely excreted in the form of trigonelline (75-94 percent) and nicotinuric acid from 6 to 25 percent.

In part I the authors had the technical assistance of M. Stenhouse and R. Forth, and in part II of Stenhouse.

Environmental temperatures and thiamine requirements, C. A. Mills (*Amer. Jour. Physiol.*, 133 (1941), No. 3, pp. 525-531, figs. 3).—Young rats were kept in separate cages in two rooms of the same relative humidity, 60 percent, but different temperatures, 65° and 91° F., and given identical diets except for a thiamin content which was graded at 0.2, 0.4, 0.6, 0.8, 1.2, and 1.6 mg. per kilogram of food mixture. Detailed records were kept of the food consumption and weight gains.

In the hot room the food consumption of the individual groups was almost quantitatively proportional to the increase in thiamin content of the diet up to 1.2 mg. per kilogram, with a slightly lower consumption at the 1.6-mg. level. The growth rate and growth efficiency (grams of food intake per gram of weight gain) were also highest at the 1.2-mg. level, although the differences were slight in growth between the 1.2- and 1.6-mg. levels. In the cold room only the groups receiving the two lowest proportions of thiamin consumed little food and lost weight. The best performance was given by the group receiving 0.8 mg.

Taking into consideration food consumption, growth rate, and growth efficiency, the optimal response at 91° required about twice as high a dietary content of thiamin as at 65°. The actual quantity of thiamin consumed, however, was about the same, suggesting that on an economic basis it would probably be less expensive to administer thiamin in pure form or with some food universally used than to try to obtain adequate amounts in natural foods. "Only by thorough trial can the protective value of thiamin against excessive heat be established for man. Daily administration of supplemental thiamin should make workers in boiler or furnace rooms, or in other types of severe heat exposure, more resistant to the heat effects. It should also prove helpful for temperate zone residents who are hypersensitive to the heat waves of summer and for those who have developed symptoms of heat exhaustion."

The thiamin content of human blood and urine as determined by the fermentation method, R. GOODHART (*Jour. Clin. Invest.*, 20 (1941), No. 6, pp. 625-630, figs. 4).—The ultramicrofermentation method described by Atkin, Schultz, and Frey (*E. S. R.*, 83, p. 444) was used, with minor modifications.

In 86 determinations on blood samples from 45 presumably normal subjects, the minimum, maximum, and average values obtained were 3.1, 9.2, and 5.39 μg . percent, the values agreeing reasonably well with those calculated from cocarboxylase values reported by Goodhart and Sinclair (E. S. R., 83, p. 420). In 42 determinations of the 24-hr. urine excretion values of 11 normal subjects, corresponding values were 240, 1,327, and 596 μg . The higher urine values obtained by the fermentation method than by most other procedures are attributed to the high content in the urine of 2-methyl-5-hydroxy-methyl-6-aminopyrimidine, shown by Schultz et al. (E. S. R., 79, p. 11) also to stimulate fermentation of glucose by yeast.

Blood thiamin determinations on 106 patients from the wards of a hospital psychiatric division gave values below 3.1 μg . per 100 cc. in 22 cases, of whom 18 were suffering from peripheral neuritis. The association between acute peripheral neuropathy and low blood thiamin values suggests the likelihood that blood thiamin values below 3.0 μg . percent, as determined by the fermentation method, will prove to be a definite indication of a thiamin deficiency state.

The author had the technical assistance of T. Nitzberg.

Blood pyruvate curves following glucose ingestion in normal and thiamine-deficient subjects, E. BUEDING, M. H. STEIN, and H. WORTIS (*Jour. Biol. Chem.*, 140 (1941), No. 3, pp. 697-703, figs. 2).—Evidence is presented leading to the conclusion that pyruvic acid is a normal intermediary of carbohydrate catabolism in man. In 27 observations on 23 apparently healthy, well-nourished subjects, the ingestion of glucose (1.75 gm. per kilogram body weight as a 25-percent solution in tea) was followed by a significant rise in blood pyruvic acid, as determined by the method described previously (E. S. R., 85, p. 852), with slight modifications. The maximum rise occurred at the end of 60 min. in every case but one, in which the peak was reached in 30 min. A fall to the normal fasting range occurred in all but one instance at or before the third hour. In 13 subjects with thiamin deficiency the maximum rise in pyruvic acid was greater than in the normal subjects and did not reach maximum levels until the end of from 2 to 4 hr.

Sensitization to thiamine hydrochloride, C. L. LAWS (*Jour. Amer. Med. Assoc.*, 117 (1941), No. 3, p. 176).—In the case report presented evidence is given of induced sensitization to thiamin hydrochloride following prolonged subcutaneous administration in doses of 25 mg. or more. The treatment started in September 1940 with daily injections for 10 days, followed by injections at weekly intervals. Sensitization was first noted in February 1941. Two mo. later, when an interval of 10 days had elapsed between tests, the injection produced anaphylactic shock, requiring epinephrine for relief. Intradermal tests demonstrated the allergic effect of the thiamin. The advisability is suggested of making intradermal tests with thiamin hydrochloride before administering it, particularly to patients who previously had received thiamin.

Vitamin deficiencies and flour milling, C. E. RICH (*Chem. and Indus.*, 60 (1941), No. 33, pp. 611-618).—This paper, presented as an address, is concerned with the reasons for milling vitamin B₁ out of the flour and methods of increasing the vitamin B₁ content of bread. In considering what the miller can do about it, it is pointed out that retention of the bran coat and germ would insure an adequate vitamin B₁ supply, but that these portions of the kernel contain substances detrimental to good baking quality so that a balance will have to be struck at some point between nutritive value and baking quality.

Thiamin content of commercial wheats of the 1940 crop, D. E. DOWNS and W. H. CATHCART (*Cereal Chem.*, 18 (1941), No. 6, pp. 796-801).—Data are reported on the thiamin content of 149 samples of wheats from at least 18 States.

The samples, presumably of the 1940 crop, were assayed by the fermentation method of Schultz, Atkin, and Frey (E. S. R., 83, p. 417).

The values found ranged from 4.1 to 10.2 μg . per gram ("as received" moisture basis). There was a wide variation among samples from any State, but in general those States producing hard winter wheat (except Oklahoma) gave thiamin values of 7 μg . per gram or more, while States producing soft red winter or white wheats gave thiamin values of from 5.7 to 6.1 μg . The 8 samples of Dakota spring wheats had an intermediate value of 6.5 μg . The number of pure variety samples grown over a wide area was not sufficient to show any varietal trends. Tenmarq and Turkey samples (hard wheats) were very near the average for the State in which grown. In general the hard wheats, those having a hard, vitreous berry with accompanying higher protein content, had a higher thiamin content, averaging 7.1 μg . per gram, than the softer wheats which averaged 6.1 μg . per gram.

The thiamin content of cereal grains, R. NORDGREN and J. S. ANDREWS (*Cereal Chem.*, 18 (1941), No. 6, pp. 802-811, fig. 1).—Thiamin was determined by the Hennessy and Cerecedo modification of the thiochrome method (E. S. R., 82, p. 588) in wheats of different types and varieties grown in different environments. The data, subjected to statistical analysis, showed that in the 6 varieties of spring wheats grown in four locations in Minnesota environmental factors played a large role in deciding the thiamin content, while variety factors were of much less consequence; and that there was a significant relationship between thiamin and ash but not between thiamin and protein. In the case of 4 varieties of winter wheat, each grown in four regions in Nebraska and Kansas, both variety and environment were highly significant and of similar magnitude, and no significant relation existed between thiamin and ash or between thiamin and iron content. In a series of soft wheats grown in one location in Ohio, 12 of the 15 samples were within 3 percent of the average, 2 were only about 10 percent below average, and 1 was somewhat above average. Since only single samples were represented, the differences were not ascribed to varietal effect. Twelve west coast wheats had an average thiamin content similar to that of the winter wheats grown in Midwestern States. In a series of Canadian wheats the Winnipeg-grown samples, with the exception of one variety, were higher in both thiamin and ash than the corresponding varieties grown in other locations. Despite this, there was no significant relation between the vitamin and ash in either group. It is concluded that the thiamin content of wheat is influenced by wheat type, variety, and environment. In general the durum and spring wheats contained the largest amount of thiamin (from 1.45 to 3.49 mg. per pound), followed by hard winter (from 1.65 to 2.71 mg. per pound), and soft (from 1.79 to 2.38 mg. per pound) wheats. Corn, rye, barley, and sorghum were found similar to wheat in their thiamin contents, while oats contained somewhat more (from 3.68 to 4.90 mg. per pound).

Thiamin in the products of wheat milling and in bread, R. C. SHERWOOD, R. NORDGREN, and J. S. ANDREWS (*Cereal Chem.*, 18 (1941), No. 6, pp. 811-819, figs. 3).—The thiamin content of products of commercial milling was determined in samples taken from three different hard wheat mixes, and from these values and the average values for milling yields the percentage of the total wheat thiamin in each of the milled products was calculated. The calculations indicated that patent, first clear, second clear, and red dog flours, representing, respectively, 63.0, 7.0, 4.5, and 4.0 percent of the cleaned wheat, contained, respectively, 8.0, 3.9, 10.0, and 22.0 percent of the total thiamin of the whole grain; germ, shorts, and bran representing 0.2, 12.3, and 9.0 percent of the milling yield contained, respectively, 0.9, 39.6 and 15.6 percent of the total thiamin of the wheat.

The relatively low proportion of thiamin in the germ is accounted for by the fact that less than 10 percent of the total germ was recovered in the germ stream. Ash values, which reflect the type of milling, were found to parallel closely the thiamin values in the patent, clear, and red dog flours, but in the shorts and bran further increases in ash were associated with marked and irregular decreases in thiamin. This relation between ash and thiamin contents was found to exist not only in the milled products but in millstreams which were obtained from many mills. In the latter the high correlation between ash and thiamin prevailed until the ash content reached about 2.5 percent. Above this value the correlation was less significant because of the varying amounts of outer bran tissues which are low in thiamin. Analyses of the various products and millstreams indicated that the major part of thiamin occurs in the tissues beneath the outer bran, these tissues being responsible for the high thiamin content of the feeds such as red dog and shorts. Commercial whole-wheat flours from 31 mills distributed over the United States averaged 2.27 mg. of thiamin per pound (range 1.92-2.53), and the breads baked from these flours in the laboratory by a commercial formula averaged 1.36 mg. of thiamin per pound of fresh bread.

Vitamin C content of wild fruit products, M. ANDROSS (*Analyst*, 66 (1941), No. 786, pp. 358-362).—The vitamin C content, determined by the procedure of Mack and Tressler (*E. S. R.*, 78, p. 154), is reported for wild rose hips analyzed raw, at the underripe, ripe, and overripe stages, as the dried product, and in the form of several cooked products, including a purée and a jam. The rose hips, containing in the raw state from 370 to 623 mg. of ascorbic acid per 100 gm., and the products made from them are particularly recommended for use in the English diet to take the place of citrus fruits now unavailable. Other fruits, analyzed in the raw state and in the form of several products, including fresh, canned, and bottled juices, jellies, and jams, gave the following values, in milligrams per 100 gm., for the fresh fruits: Sloe 4-8, elderberry 25-30, bramble 2-5, crab apple 10-12, cranberry (syrup) 12-18, raspberry 15-20, bilberry 8-9, and black currant 120-134.

The composition and nutritive value of potatoes, with special emphasis on vitamin C, W. B. ESSELEN, JR., M. E. LYONS, and C. R. FELLERS (*Massachusetts Sta. Bul.* 390 (1942), pp. 19).—This bulletin summarizes published information on the proximate, mineral, and vitamin composition and nutritive value of potatoes, and presents original work on their content of vitamin C. Ascorbic acid determinations were made on a sulfuric-metaphosphoric acid extract by the 2,6-dichlorophenolindophenol titration method as modified by Bessey and King (*E. S. R.*, 71, p. 137) and by Mack and Tressler (*E. S. R.*, 78, p. 154). Dehydroascorbic acid was shown to be absent. Analyses made soon after harvest of five varieties, as grown in Massachusetts and in several other States, showed little variation attributable to geographic factors but suggested varietal differences. In general the Irish Cobbler variety was highest in ascorbic acid, averaging 0.131 mg. per gram, followed in order by Katahdin (0.125), Green Mountain (0.117), Rural Russet (0.110), and Chippewa (0.097 mg per gram). In many cases differences between varieties were less than differences within a single variety. With storage varietal differences became less significant. Tests with eight varieties held for 5 mo. in dry underground storage (40°-50° F.) and in cold storage (36°) showed ascorbic acid losses to vary from 0 to 63 percent, with neither type of storage consistently superior to the other except that tubers held in cold storage were more desirable for eating purposes.

Boiling whole in the skin, baking, and French frying were the best methods from the standpoint of ascorbic acid retention, the cooking losses in these cases amounting to 27, 31, and 33 percent, respectively; losses by other methods

of cooking were appreciably higher, reaching 47 percent in boiled, peeled, halved potatoes, and as high as 79 to 80 percent in warmed-over potatoes and 74 percent in potato salad prepared from boiled potatoes held 24 hr. in the refrigerator. Ascorbic acid was found to be evenly distributed in the raw tuber, with a lesser amount in the skin. After boiling the greater amount was in the area between the central and epidermal portions, with the skin and the part just beneath it about equal in ascorbic acid content; and after baking the greatest concentration was in the central portion, with the amount decreasing progressively toward the skin.

The ascorbic acid content of different varieties of Maine-grown tomatoes and cabbages as influenced by locality, season, and stage of maturity, E. F. MURPHY. (Maine Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 9, pp. 483-502, figs. 6).—Four varieties of tomatoes were grown in 1938 and 1939 in four widely separated localities in Maine to determine the effect of geographical situation upon the production of ascorbic acid. Varietal differences were similar in the two years. Penn State Earliana had the lowest ascorbic acid value and Bestal was second lowest in all four localities, while Comet was highest at Orono and Kennebunk and Best of All was highest at Aroostook and Highmoor. In 1938 the majority of samples from Orono, Highmoor, and Kennebunk were over 0.06 mg. per gram greater in ascorbic acid content than those from Aroostook. In 1939 tomatoes grown in Aroostook were lower in ascorbic acid than those grown in Orono, but higher than those grown at Highmoor and Kennebunk. The majority of the samples were more than 0.04 mg. per gram higher in ascorbic acid in Aroostook, Orono, and Highmoor than in Kennebunk.

An analogous experiment in which four varieties of cabbages were used for the test crop confirmed the 1939 evidence obtained from tomatoes. These findings indicated that environmental agencies influenced the synthesis of ascorbic acid in tomatoes and cabbages and that geographical situation was not a contributing factor except insofar as environmental conditions were characteristic of that situation. An analysis of available weather data suggested that sunlight, rainfall, and probably temperature might have been causal agents in the variations in ascorbic acid content. As the tissue matured there was a definite rise in ascorbic acid concentration in the tomato and a decline in the cabbage. These phenomena were related to geographical situation to the extent that maturity rate was hastened or delayed by the climatic condition prevailing throughout the growing season in any one region. "Although variations effected by environment may be of greater magnitude than varietal differences, this does not lessen the importance of the varietal values. It is obvious that if a variety of low ascorbic acid content is subjected to adverse environmental influences, the tomato may well be rendered useless as a source of vitamin C. On the other hand, a high vitamin variety subjected to the same unfavorable conditions could still contribute materially to vitamin C requirements."

Serum phosphatase in infantile scurvy, H. SEWACHMAN (*Jour. Ped.*, 19 (1941), No. 1, pp. 38-41).—Serum phosphatase values for 18 infants with acute scurvy, for the most part before the institution of vitamin C therapy, ranged from 1.1 to 4.9, with an average of 3.2 Bodansky units, as compared with a range of from 4.5 to 12 and an average of approximately 7.2 units for normal infants and children. Values for 7 of the subjects during the progress of healing, in all but 2 cases with no vitamin D administration, showed, with one exception, a rise in phosphatase within approximately a week. The exception, the subject with the highest initial phosphatase value, showed on roentgenographic examina-

tion that considerable healing of a long-standing scurvy had already taken place. In view of the elevation of serum phosphatase in rickets and its subsequent decline on healing and the frequent presence of rickets and scurvy in varying degrees in the same infant, it is suggested that when a normal or high phosphatase value is obtained in an infant with acute scurvy the presence of some complicating condition such as rickets should be suspected.

Studies on the growth and development of male children receiving evaporated milk.—I. The effect of various vitamin supplements on growth in length and incidence of rickets during the first two years of life, T. F. RHODES, M. RAPOPORT, R. KENNEDY, and J. STOKES, JR. (*Jour. Ped.*, 19 (1941), No. 2, pp. 169-189, figs. 9).—Observations were made of 233 male infants receiving diets containing evaporated milk as the sole source of milk from the average initial age of 6 weeks until the age of 2 yr. The average growth in length was better than was expected according to the Kornfeld standards. At 3 mo., 1 yr., or 2 yr., there was no difference in length between the four groups represented by those receiving (1) irradiated evaporated milk, (2) nonirradiated evaporated milk plus cod-liver oil, (3) irradiated evaporated milk plus carotene, and (4) irradiated evaporated milk plus carotene and yeast. White children receiving the 1,500 units of vitamin D from cod-liver oil increased in length by a suggestively greater amount and colored children by a significantly greater amount than those receiving irradiated evaporated milk. The addition of 2,250 units of vitamin A in the form of carotene produced no significant effect on the rate of growth as compared with the effects of milk without vitamin supplements. The addition of powdered brewers' yeast, furnishing 250 units of vitamins B₁ and B₂ together with the carotene, produced a suggestively though not clearly significant greater growth in the white children, but no significant increase in length in the colored children. The incidence of roentgenographic rickets was practically the same at both levels of vitamin D intake (110 and 1,500 units daily), there being no incidence of marked rickets and only a 13.3 percent incidence of mild rickets. The various vitamin supplements had no influence on the incidence or severity of infections of the upper respiratory tract.

Vitamin K requirement of the newborn infant. R. L. SELLS, S. A. WALKER, and C. A. OWEN (*Soc. Expt. Biol. and Med. Proc.*, 47 (1941), No. 2, pp. 441-445, fig. 1).—Blood prothrombin levels were followed daily for the first few days of life in infants receiving various doses of vitamin K as 2-methyl-4-amino-1-naphthol administered intramuscularly in (1) maintenance therapy consisting of small daily injections of the vitamin, (2) prophylactic therapy consisting of a single dose administered shortly after birth, or (3) curative therapy, in which case a single dose was given after depletion had already become established. The response of the infants to the various dosages and treatments, as judged by blood prothrombin values, is interpreted to indicate that the vitamin K requirement of the newborn infant is extremely low, approximately 1 μ g. of the synthetic vitamin per day. It is suggested that milk contains enough preformed vitamin K to meet this minimal requirement.

TEXTILES AND CLOTHING

[Textile research by the Pennsylvania Station] (*Pennsylvania Sta. Bul.* 414 (1941), pp. 45-49, figs. 2).—This progress report by P. B. Mack and H. Borton of the northeastern regional textile project in which more than 1,000 fabrics have been examined indicates the tests that have been found to serve as a basis for judging the quality of cotton, wool, and rayon fabrics.

Textile materials used for household purposes by farm families, M. E. FRAYSER (*South Carolina Sta. Bul. 341 (1942), pp. 15, fig. 1*).—Information concerning the use of textiles was secured by interviews with farm homekeepers or operators in 296 white and 294 Negro households, representing about 2 percent of the white and Negro farm owner and tenant households in the eight counties in the State surveyed in this study in 1936-37. This information is summarized and discussed with respect to the inventory, customary use, and replacement of various items of bedding; table coverings and napery; and window curtains and draperies. Economic and social data, obtained as a background for the interpretation, are summarized to show the number and size of the households, the size of the farms, and the education of the farm operator and homemakers. The investigation showed that cotton was more largely used for household purposes than any other textile material and that there was a relation between size of farm, economic status, tenure, race, and the provision of household textiles. "The limited supply of household textiles shown by the inventory and the relatively few additions made to the supply during the year suggest that farm families in South Carolina could be large consumers of products made from the cotton they raise. The figures emphasize the need for a better standard of living which would make possible greater outlays for such essential articles."

Effect of wear on wool and part wool fabrics (*South Dakota Sta. Rpt. 1941, pp. 70-71*).—Reports are given to indicate the progress of studies by B. Bailey and E. M. Pierson involving actual wear tests of trousers made from wool and part-wool fabrics.

Judging fabric quality, B. V. MORRISON (*U. S. Dept. Agr., Farmers' Bul. 1831, rev. (1942), pp. [2]+22, figs. 13*).—This is a revision of a publication noted earlier (*E. S. R., 82, p. 572*).

HOME MANAGEMENT AND EQUIPMENT

[Home management studies by the Illinois Station] (*Illinois Sta. Rpt. 1938, pp. 311-325*).—This progress report (*E. S. R., 82, p. 716*) summarizes an analysis by L. Bane and R. C. Freeman of farm-home records of 280 families showing the relation of consumption patterns to family spending plans and an analysis of home accounts kept for a continuous 5-yr. period (1933-37) by 89 Illinois farm families to show the relation of consumption and expenditure patterns in years when incomes were on the increase, and an analysis by Bane, Freeman, H. C. M. Case, and N. O. Thompson of the records of 117 families keeping both farm and home accounts in an effort to gain a more complete picture of the combined resources and income uses of the farm and farm home.

Family income and expenditures: Southeast region.—I, Family income. Farm series, D. S. BRADY, D. MONBOE, M. PERRY, and M. R. PRATT (*U. S. Dept. Agr., Misc. Pub. 462 (1941), pp. VI+208, figs. 6*).—This report presents information similar to that given for farm families in other regions surveyed in the consumer purchases study (*E. S. R., 84, p. 717*).

Housing for health (*Lancaster, Pa.: Sci. Press Ptg. Co., 1941, pp. 221, [pls. 2], figs. [20]*).—This volume, presented under the auspices of the Committee on the Hygiene of Housing of the American Public Health Association, includes the following papers: Health and Housing, by C. E. A. Winslow (pp. 7-17); Enforcement and Subsidy in the Control of Slums, by L. M. Graves and A. H. Fletcher (pp. 18-36); An Experiment in Housing Survey and Inspection Procedures for Health Departments, by G. C. Ruhland (pp. 37-47); Housing Codes, by M. G. Lloyd (pp. 48-53); Health Centers and Health Services in

Housing Projects, by J. C. Leukhardt (pp. 54-66); Heating, Lighting, and Noise Conditions in Recent Housing Projects, by A. A. Twichell (pp. 67-89); Heating and Ventilation of the Home, by C. E. A. Winslow (pp. 90-102); New Possibilities in Low-Cost Home Construction, by R. L. Davison (pp. 103-108); Planning for Recreation, by F. J. Adams (pp. 109-115); Family Life as the Basis for Home Planning, by S. H. Riemer (pp. 116-139); Social Effects of Good Housing, by F. S. Chapin (pp. 140-158) (Univ. Minn.); and Certain Characteristics of Urban Housing and Their Relation to Illness and Accidents, by R. H. Britten, J. E. Brown, and I. Altman (pp. 159-181). Basic principles of healthful housing are presented in an appendix.

What war is doing to the farm family, D. DICKINS. (Miss. Expt. Sta.). (*Jour. Home Econ.*, 34 (1942), No. 6, pp. 358-361).—This paper, dealing with the effects of national defense on the socioeconomic situation of the family, is based on studies noted elsewhere (E. S. R., 83, p. 286; 87, p. 321).

MISCELLANEOUS

Scientists face the world of 1942 (*New Brunswick, N. J.: Rutgers Univ. Press*, 1942, pp. [5]+80).—This includes the following essays: Scientists Face the World of 1942, by K. T. Compton (pp. 3-32); The Case for Biological Engineering, by V. Bush (pp. 33-45); and The Case for Agricultural Engineering, by R. W. Trullinger (pp. 46-62). Commentaries by H. N. Davis, D. Bronk, and S. W. Fletcher are appended.

A year's progress in solving farm problems of Illinois: [Fifty-first Annual Report of Illinois Station, 1938], compiled and edited by F. J. KELLHOLZ (*Illinois Sta. Rpt.* 1938, pp. 350, figs. 59).⁴

Science for the farmer: Fifty-fourth Annual Report of the Pennsylvania Agricultural Experiment Station, [1941], [S. W. FLETCHER] (*Pennsylvania Sta. Bul.* 414 (1941), pp. [4]+63, figs. 20).⁴

Farm research in South Dakota: Fifty-fourth Annual Report [of South Dakota Station, 1941], I. B. JOHNSON ET AL. (*South Dakota Sta. Rpt.* 1941, pp. [2]+97, figs. 4).⁴

What's new in farm science: Annual report of the director, [Wisconsin Station, 1941], II, compiled by N. CLARK and N. HOVELAND (*Wisconsin Sta. Bul.* 455 (1942), pp. [2]+87, figs. 34).—This supplements and completes the report previously noted (E. S. R., 86, p. 876), dealing with the subjects of milk and livestock production, poultry, hay and pasture, grains, weed control, soil management, potatoes, canning peas, vegetables, fruits, forestry, tobacco, factors affecting root development, and nosema disease in beekeeping.⁴

Plant science institutions, stations, museums, gardens, societies, and commissions in Central and South America (*Chron. Bot.*, 7 (1942), No. 2, pp. 49-61).—This list is a revised edition of the Central and South American part of the last world list,⁵ and has been discussed editorially (E. S. R., 87, p. 325).

A list of plant scientists in Central and South America (*Chron. Bot.*, 7 (1942), No. 3, pp. 97-133).—This list has been discussed editorially (E. S. R., 87, p. 325).

⁴ The experimental work not previously referred to is for the most part noted elsewhere in this issue.

⁵ *Chron. Bot.*, 4 (1938), No. 4-5, pp. 203-383.

NOTES

Arizona Station.—Dr. Alfred B. Caster of the Washington Station has been appointed assistant chemist. His work will include analyses of soils, irrigation water, fertilizers, and feeds, as well as research into problems of soil fertility.

Arkansas University and Station.—The resignations are noted of Rebecca Gifford, instructor and assistant in veterinary science, and Mildred Stenswick, instructor in home economics. Stewart Rowe and Runyan Deere, scientific assistants in the Cotton Branch Experiment Station, and W. H. Wiley, instructor in animal industry, have entered military service. Broder F. Lucas has been appointed professor of forestry and forest economist.

California University and Station.—Dr. Stanley B. Freeborn, assistant dean of the College of Agriculture and assistant director of the station, has joined the Army and is in charge of malaria research on the Pacific coast. Dr. W. V. Cruess, head of the division of fruit products in the station, has been awarded the first Nicholas Appert Medal by the Institute of Food Technologists.

Florida Station.—The station is looking into the possibilities of local production of a number of crops formerly largely imported. Among those with which trials are being made are a French-type teasel, sage, endive, and paprika.

Pliofilm, a new wrapping material which has been under test by the station for several years, has been found to be very effective in preserving fresh fruits and vegetables without appreciable losses of moisture, appearance, taste, vitamins, or quality either in cold storage or on the retail stand. Unfortunately, the material, a transparent synthetic plastic, consists largely of rubber hydrochloride, but it is believed to have distinct possibilities under normal conditions of rubber supply.

Hawaii University.—Gregg M. Sinclair has been appointed president vice Dr. David L. Crawford, retired.

Illinois University.—The industrial chemical investigations of the U. S. D. A. Regional Soybean Industrial Products Laboratory have been transferred from the university campus to the Northern Regional Research Laboratory at Peoria, leaving only an agronomic laboratory and oil, meal, engineering, and analytical units. Dr. T. H. Hopper, director of the laboratory, has been appointed chief of the analytical and physical chemical division of the Southern Regional Research Laboratory at New Orleans.

Kentucky University and Station.—The resignations are noted of Dr. B. S. White, Jr., as assistant professor and assistant in marketing, Drs. E. S. Hodge and W. S. Hodgkiss and G. Donald Sherman as assistant chemists, and W. L. Wright as instructor and assistant in animal husbandry. Military leave has been granted to Dr. A. T. Ringrose, assistant professor and assistant in poultry husbandry, and H. S. McGuire, assistant bacteriologist. Recent appointments include Dr. Henry Noble Sherwood as assistant bulletin editor, Dr. J. T. Skinner and Paul R. Scripture as assistant chemists, Emmet Dozier, Jr., as inspector in the creamery license section, Kenneth Anderson and James Browder as field agents in cream grading, Benn L. Hornbeck as junior forester, and J. Aaron Shrader as assistant bacteriologist.

Louisiana University and Station.—Recent appointments include Drs. Rue Jensen as assistant professor and assistant in veterinary science and J. E. Welch as assistant horticulturist, replacing, respectively, Drs. W. C. Schofield and Fred D. Cochran, who have been called to Army duty; Dr. Morris B. Hughes as geneticist; and Dr. Paul Johnson to assist in chemical analysis of new seedlings under the sweetpotato-breeding program.

Massachusetts Station.—Dr. Carl Olson, Jr. research professor of veterinary science, has reported for active duty as captain in the U. S. Veterinary Corps.

Michigan College and Station.—An apricot seedling contest has been arranged at the South Haven Substation in a search for native stock to use in crosses with leading commercial varieties grown on the Pacific coast in an attempt to develop hardy strains for Michigan. A quart sample of fruit is submitted with each sample entry. Cash prizes of \$25, \$15, and \$10 have been offered by the State Horticultural Society for the three best native seedlings.

George M. Grantham, who retired as associate professor and research associate in soils about a year ago, died June 13 at the age of 53 years. A native of Indiana, he received the B. S. degree from the University of Illinois in 1914 and the M. S. degree from the University of Nebraska in 1927. His service had been exclusively in Michigan, beginning in 1914 as an instructor in soils.

Dr. Eugene G. McKibbin, professor and research professor of agricultural engineering in the Iowa College and Station, has been appointed head of the department of agricultural engineering, effective September 1, vice H. H. Muselman, retired after 33 years' service.

Minnesota University and Station.—The position of vice director in the station has been redesignated as that of associate director. There has been no change in the status or duties of the position, which continues to be held by Dr. Forest R. Immer, who has immediate charge of all phases of experiment station administration. Effective July 1, Dr. Clayton O. Rost, professor of soils and soils chemist, became head of the division of soils. Other appointments in the division included Dr. Alfred C. Caldwell; Fred Bentley, now conducting research work; and Olaf C. Solne.

Dr. N. N. Allen, assistant professor of dairy husbandry and assistant dairy husbandman, has resigned to become associate professor of dairy husbandry in the University of Vermont.

Montana College and Station.—Dr. R. R. Renne, head of the department of agricultural economics, has been appointed State Price Officer of the U. S. Office of Price Administration, but will continue, on a limited basis, his relations with the station. Dr. Harold F. Hollands, professor of agricultural economics and agricultural economist, has been granted an indefinite leave of absence to become associated with the food supply section, Consumers' Division, of the U. S. War Production Board.

New York State Station.—Drs. B. R. Nebel, associate, and Mabel R. Nebel, assistant in research (pomology), have resigned. The former is to study in the University of Rochester Medical School, and has been succeeded by Dr. John Einset.

Ohio Station.—Owing to the war-time interest in homemade equipment exhibits prepared for Ohio Poultry Day, it has been arranged to keep some of them available for farmers and poultrymen who visit the station during the coming year. Exhibits to be retained include equipment for labor saving, feeding, and watering in the laying house and on the range, all wood except for nails; range shelters made of rough native lumber; an electric lamp brooder; rat eradication and control methods; and a brooder house equipped for farm grain storage.

Oklahoma College and Station.—Dr. Louis E. Hawkins, associate professor of animal husbandry at the college for 6 years and of late agricultural commissioner for the Kansas City Chamber of Commerce, has been appointed station vice director, succeeding Dr. Lippert S. Ellis, resigned to become regional director of research at Little Rock, Ark., for the Division of Land Economics, U. S. D. A. Bureau of Agricultural Economics.

Rhode Island College and Station.—Dr. Mason H. Campbell, for 14 years professor of dairy production at the University of Vermont and for the past year in commercial work, has been appointed dean of the School of Agriculture and Home Economics and director of the station, effective September 1.

South Dakota Station.—Recent appointments include Morris Rhlan, associate agricultural chemist; George F. Gastler, analyst; E. I. Whitehead, assistant chemist; and Erhardt Hehn, assistant agronomist. Dr. H. D. Anderson, associate chemist, has resigned to accept a position with the Michigan Public Health Department.

Utah College and Station.—C. J. Hogenson, extension agronomist since 1918 and associated with the institution since 1907, died in March in his sixty-eighth year. A native of Denmark, he was graduated from the college in 1899 and received the M. S. A. degree from Cornell University in 1906. In 1903-5 he was a soils expert with the U. S. D. A. Bureau of Soils. He has been succeeded by A. F. Bracken, associate professor of agronomy and associate agronomist and superintendent of the Nephi Dry Land Substation.

Dr. Wayne Binus, assistant professor of veterinary medicine and animal pathologist, has been called to active duty in the Army Veterinary Corps.

Wisconsin University and Station.—Dr. Ira L. Baldwin has been appointed chairman of the department of agricultural bacteriology, and Dr. C. L. Fluke chairman of the department of economic entomology. Vincent E. Kivlin succeeds Dr. Baldwin as assistant dean and John R. Barton becomes director of the farm short course, but each of these will continue his former work in agricultural education and rural sociology, respectively.

American Dairy Science Association.—The thirty-seventh annual meeting of this association was held at East Lansing, Mich., from June 23 to 26, 1942, with a registration of approximately 350, representing practically all States and drawn mainly from the agricultural colleges and experiment stations. The presidential address was given by H. F. Judkins. Of particular interest on the program were four symposia dealing, respectively, with the project on input as related to output in milk production, nutrition and reproduction in dairy cattle, problems in dairy manufacturing due to the war, and problems in the securing of milk quality. There were many indications of the shift in emphasis in research programs to meet war-time demands.

Tentative plans were discussed for a 1943 meeting to be held at the University of Missouri.

Association of Official Seed Analysts.—The 1942 annual meeting of this association was held at Lexington, Ky., in July with about 100 registrants from 23 States, the District of Columbia, and several provinces of Canada. Future meetings are to be deferred until the end of the war, but arrangements were made to carry on the work of the association by its officers. Charles A. Stahl of Lansing, Mich., was elected president; N. G. Lewis of Calgary, Alta., vice president; and Dr. Elva L. Norris of Manhattan, Kans., secretary.

EXPERIMENT STATION RECORD

VOL. 87

NOVEMBER 1942

No. 5

THE AGRICULTURAL EXPERIMENT STATIONS IN 1941

The publication of the latest report of the Office of Experiment Stations to Congress on the work and expenditures of the agricultural experiment stations has made available in convenient form another year's summary of the accomplishments of these institutions. The period covered is the fiscal year ended June 30, 1941.

The report indicates that during this period the research work of the stations proceeded for the most part along well-established lines, but with increasing emphasis upon those phases of immediate applicability to the national defense. Nearly 8,400 projects were under way. The financial support for this extensive program reached an aggregate of \$22,433,550.29. This was an increase of \$1,216,801.68 over the previous year, and was the high-water mark in the stations' history. The 1941 income consisted of \$6,862,500 from the four Federal-grant funds and \$15,571,050.29 of non-Federal funds, including State appropriations, special endowments and fellowships, fees, sales, miscellaneous sources, and the unexpended balances from the preceding year.

The Federal grants to the States, Territories, and Puerto Rico for agricultural research in 1941 compared with \$6,848,750 in 1940; the increase of \$13,750 consisting of \$7,500 to Hawaii, \$5,000 to Puerto Rico, and \$1,250 to Alaska under the Purnell Act. The amount of funds made available by the States in 1941 compared with \$14,367,998.61 in 1940, an increase of \$1,203,051.68. The income of the stations from sources other than Federal-grant funds was approximately \$2.27 for each \$1 of income from the Federal grants.

In addition to these direct sources of support the research work of the stations was aided and augmented by much cooperative effort. Extensive cooperation with the Department of Agriculture contributed to the progress of both groups of institutions. There was also much interstation cooperation which in the aggregate added considerably to the effectiveness of these research agencies.

In addition to a large amount of informal cooperation, nearly 1,350 new or revised formal memoranda of understanding covering cooperative research between bureaus of the Department and the State stations were recorded, involving nearly 1,200 major research under-

takings. All of the State stations, as well as all of the research bureaus and two of the action agencies of the Department, participated in this broad program, which involved from 8 to 55 research agreements per station and covered practical field problems of nearly every major aspect of farm production and rural life.

The amount of cooperative research brought to successful completion during the year was again relatively large. In all, more than 200 major cooperative studies were completed.

Interest in the defense activities of the Nation led to the focusing of research on the practical aspects developed out of broad studies begun in earlier years as recovery measures. The cooperative agricultural-adjustment study, which previously had been active on a national basis, was completed in all but six States and was being superseded in all but three States by the cooperative agricultural land use study for which it had laid much of the foundation. The results of numerous other cooperative studies were being used as a part of the procedure in agricultural planning.

Interstate coordination of agricultural research developed more rapidly than usual during the year. For example, the need to expedite movement of agricultural commodities from farm to market and from market to consumer developed into a problem of common concern to the majority of States. Informal community interest in marketing by regions resulted during the year in the formation of comprehensive formal cooperative studies of marketing of livestock and livestock products in two major regions.

The increasing recognition by Federal and State agencies of the importance of good nutrition to health and welfare, particularly in times of national emergency, has added impetus to the efforts of groups of States to solve some of the practical aspects of certain basic problems of human nutrition. Among the studies continued by these groups were those dealing with the nutritional status of college women, the ascorbic acid metabolism of college students, and the variation in the components and nutritive value of vegetables grown in the South.

In 1941, the Federal-grant research of the experiment stations was conducted under 3,235 separate projects, 515 being supported wholly or in part by Adams funds, 1,690 by Purnell funds, and 1,030 by Bankhead-Jones funds. Of the active projects, 600, or more than 18 percent, were revised or closed within the year. There were 374 new projects, 193 revisions, and 407 completions.

Information made available to the Office by the stations on their non-Federal research showed a total of 5,137 projects active in 1941. During the year, therefore, the experiment stations had 8,372 projects under investigation.

Their efforts to expedite solution of pressing problems and re-direct research on critical aspects of an emergency character are reflected in part in the project statistics for the year. The 600 Federal-grant projects revised or completed in 1941 compare with 435 in 1940, 429 in 1939, 405 in 1938, 333 in 1937, and 438 in 1936. According to the total of projects active during the year, the percentages revised or completed by these years, in the same sequence, were 18.5, 13.7, 14.2, 14.2, 12.6, and 17.2 percent.

The number of research workers on the station staffs in 1941 was 4,755, an increase of 162 over 1940. The increase consisted of 45 full-time research workers and 117 whose time was divided between research and resident teaching or extension, or research and both resident teaching and extension work. Of the 4,755 technical workers in 1941, 2,303 gave their full time to research while the time of the other 2,452 was devoted partly to research and partly to resident teaching or extension work or both.

The publications of the stations in 1941 included 834 bulletins and circulars in the regular series, 2,411 articles in scientific journals, and 701 miscellaneous publications. The comparable figures for 1940 were 732, 2,386, and 486, respectively.

It is estimated that the station publications collectively comprised nearly 50,000 printed pages. Necessarily, therefore, although 106 of the 128 pages of the report are devoted to a summary of activities, no attempt has been made to cover all of the research projects active during the year or even to present a complete review of the results obtained. The aim has been to make selection within the several fields to depict the wide range of the subjects studied and the findings having greatest significance in the solution of the current problems.

The general plan followed in the discussion is that of recent years, but the space available has been curtailed to less than 50 percent of that in the corresponding report for 1940. In view of this situation and in order to expedite the publication of findings where possible, special provision was made for the transfer of the sections dealing with agricultural engineering and home economics to other mediums of publication. Notwithstanding these changes it is hoped that the compendium will be useful as the most complete presentation available of what has been accomplished by the stations in this year of pre-war preparation.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY AND MICROTECHNIC

Liebig and after Liebig: A century of progress in agricultural chemistry, edited by F. R. Moulton (*Amer. Assoc. Adv. Sci. Pub.* 16 (1942), pp. [71]+111, [pl. 1], figs. [14]).—A symposium of papers presented before the sections of chemistry and agriculture of the American Association for the Advancement of Science at Philadelphia on December 30, 1940, in commemoration of the hundredth anniversary of the publication of Liebig's Organic Chemistry in Its Applications to Agriculture and Physiology. These papers are as follows: Justus von Liebig—Man and Teacher, by C. A. Browne (pp. 1-9) (U. S. D. A.); Liebig's Influence in the Promotion of Agricultural Chemical Research, by H. R. Kraybill (pp. 10-18) (Purdue Univ.); Liebig and the Chemistry of Proteins, by H. B. Vickery (pp. 19-29) (Conn. [New Haven] Expt. Sta.); Liebig and the Chemistry of Enzymes and Fermentation, by A. K. Balls (pp. 30-39) (U. S. D. A.); Liebig and the Chemistry of Animal Nutrition, by P. E. Howe (pp. 40-47); Liebig and the Chemistry of the Soil, by R. Bradfield (pp. 48-55) (Cornell Univ.); Liebig—the Humus Theory and the Role of Humus in Plant Nutrition, by S. A. Waksman (pp. 56-63) (N. J. Stas.); Liebig and the Chemistry of Mineral Fertilizers, by H. A. Curtis (pp. 64-70) (Univ. Mo.); Liebig and the Law of the Minimum, by C. A. Browne (pp. 71-82) (U. S. D. A.); and Mineral Requirements of Plants as Indicated by Means of Solution Cultures, by B. E. Livingston (pp. 83-111).

[Chemical investigations by the Idaho Station] (*Idaho Sta. Bul.* 244 (1942), pp. 23, 31-33, 35).—These include the development by L. Verner and C. F. Dietz of prune nectar as a new Idaho product and studies of the effect of stage of maturity on feeding value of arrowleaf balsamroot, by D. W. Bolin and W. M. Beeson; the cobalt content of some Idaho feeds, by Bolin; and on the use of ground raw soybeans added to dehydrated alfalfa meal to retard the destruction of carotene, by Bolin, C. E. Lampman, and L. R. Berg.

[Chemical investigations by the Indiana Station]. (Partly coop. U. S. D. A.). (*Indiana Sta. Rpt.* 1941, pp. 12-16).—Chemical studies on hybrid corn are reported upon by D. M. Doty; fractionation of glycerides of soybean oil and other liquid vegetable fats, by A. W. Kleinsmith, H. R. Kraybill, and M. H. Thornton; the production of nonbreak soybean oil, by K. E. Eldridge, Kraybill, and Thornton; spectral absorption studies on vegetable oils, by J. H. Mitchell, Jr., and Kraybill; nonfat constituents of soybean oil, by Thornton and Kraybill; carbohydrates of the soybean, by E. D. Walter; improvements in the photoelectric spectrophotometer, by F. P. Zschelle; carotenoid pigments and content of corn grains, by Zschelle, J. W. White, and A. M. Brunson; carotenoid pigments and content of vegetables, by Zschelle, B. W. Beadle, and Kraybill; vitamin A in butterfat, by Zschelle, C. L. Shrewsbury, Kraybill, and R. L. Henry; the spectroscopy of chlorophyll, by Zschelle, C. L. Comar, and G. D. Harris; and work on photosynthesis, by Zschelle and L. F. Green.

[Chemical investigations by the Puerto Rico Station]. (Partly coop. U. S. D. A. et al.). (*Puerto Rico Sta. Rpt.* 1940, pp. 11-18, 19-22, 23-33, 44-49, 85-93, figs. 10).—These include control of moisture content of vanilla beans in processing,

limitation of enzyme activity by excessive drying, relation of splitting of beans to length of exposure to killing agents, superiority of dilute concentrations of ethylene gas over greater concentrations, high content of peroxidase in vanilla beans, increase of respiration by ethylene gas as killing agent for vanilla beans, freezing to decrease respiration of vanilla beans, effect of killing agents on respiration rate during processing period, various degrees of maturity in relation to processing, higher vanillin content and total solids values in extracts of mature beans, standardized organoleptic tests to measure value of cured beans, and organoleptic tests of extracts by the U. S. Department of Agriculture and similar tests of cured beans in Mayaguez, all by F. E. Arana, A. K. Balls, A. G. Kevorkian, and E. Hernández Medina; standardization of methods of determining quinine in bark and variation of quinine content of bark in same tree, by H. T. Love; increased citral content in oil and decreased percentage of oil and grass tonnage by shading, increase in yield of lemon grass by lengthening growth period, the yields of grass, oil, and citral per acre per week in relation to the growth period, a fertilizer-constituent experiment with lemon grass, increase in tonnage of lemon grass on Catalina clay soils by potassium fertilizers, nitrogen plus potash as a requirement for highest yields of citral per acre, increased applications of nitrogen as a cause of increased lemon grass tonnage and citral yield per acre, and increase in yield of oil obtained in distillation of lemon grass by adding sodium chloride, and use of rock salt in distillation water to increase yield and quality of bay oil and chemical and physical properties of bay oil obtained by distillation from salt solution, all by A. R. Villamil and N. G. Arrillaga; lemon grass residue as a possible cattle feed, by Villamil and A. Arroyo; relation between carbohydrates and toxic constituents in *Derris* and *Tephrosia* roots, modified method of sugar determination, and carbohydrates and toxic constituents in normal plants of *D. elliptica*, all by R. H. Moore and M. A. Jones; wine from juice of Puerto Rican oranges and the influence of maturity on the amount of juice, acid, and sugars in local oranges, by J. O. Carrero; and the nonvolatile acids and flavor of the soursop, vitamin C content of the fruit, identification of a mixture of malic, citric, and isocitric acids, separation of light alcohols and acetaldehyde in determining flavor, flavor influence of an oil composed of several esters, and various caproates as contributors to soursop flavor, and the nonvolatile acids of the carambola, identification of traces of malic and citric acids, and oxalic acid as source of the acidity, all by E. K. Nelson and A. L. Curl.

The chemical composition of Atlas and Dwarf Yellow milo plants in relation to chinch bug resistance, J. E. WEBSTER and V. G. HELLER (*Oklahoma Sta. Tech. Bul. 12* (1942), pp. 29, figs. 3).—Analysis of these sorghum varieties at growth stages up to but not beyond the heading stage gave the following indications as to differences in resistance to chinch bug injury.

The solids content of the juice, generally higher in the susceptible milo, did not seem to show a significant difference. The milo plants were consistently higher in ash content under all conditions, and this value would seem to merit further consideration. Neither of the acidity measurements (total titratable acidity and pH) showed significant differences. Astringency values, including tannins, do not seem capable of explaining any of the known differences in resistance. Sugars in both varieties increased progressively at least up until heading time. Although Atlas (resistant) is known as a sweet sorghum, during the periods under examination the milo plants invariably contained the more sugars. Atlas rarely contained any appreciable sucrose, while the milo always had some and generally large quantities. The percentage of sucrose in the milo at late afternoon was always much greater than in the morning, and

the difference between the two varieties at this time of day seems fundamental and more noteworthy than any other found. There were marked differences in the total nitrogen content of the plants and juices, Atlas normally showing a decreasing content with growth while the milo percentages increased. Conductivity studies indicated little difference between the two varieties. Analyses for chlorides were made on many samples, and the higher values usually found for the milo may be significant. There appeared to be no significant correlation between resistance and the catalase, oxidase, or peroxidase activity. The milo plants were generally found to be higher in phosphorus, potassium, and calcium. The hydrocyanic acid content of both varieties was found to be generally the same. Separate analyses of leaves and stalks did not yield significant data.

Supplement to soybean protein—resume and bibliography, G. H. BROTHER, A. K. SMITH, and S. J. CIRCLE (U. S. Dept. Agr., Bur. Agr. Chem. and Engin., [1942], ACE-62, Sup. 1, pp. 11).—This supplement to the bibliography already noted (E. S. R., 86, p. 150) gives additional classified references under the headings agronomic and general, treatment and processing of whole soybeans, soybean protein extraction and characteristics, hydrolytic products of soybean protein, enzymes of the soybean, and industrial applications.

Studies on the ceruleomolybdate determination of phosphorus, B. R. BERTRAMSON. (Oreg. Expt. Sta.). (Soil Sci., 53 (1942), No. 2, pp. 135-141, figs. 2).—The author adapted a modification of the Denigès colorimetric method (E. S. R., 44, p. 611) for use with a photoelectric colorimeter in place of the visual instrument. Adjustment of the pH of the test solution according to the procedure of Dickman and DeTurk (E. S. R., 70, p. 7) was made a part of the improved technic. By the use of a photoelectric colorimeter conformity of the test to Beer's law was demonstrated for from 0.05 to 1.75 p. p. m. of phosphorus as o-phosphate. As much as 4.5 milliequivalents of ammonium or magnesium sulfate could be present in 50 cc. of the final test solution without seriously affecting the results. At higher concentrations the magnesium ion apparently exerted a greater effect upon color development than did the ammonium ion.

An apparatus for the effective preservation of the stannous chloride solution under hydrogen for an unlimited period of time is described. The preparation and storage of the other reagents, thus ensuring consistent results over a long period and providing for speed and accuracy in routine analysis, were also studied.

Applicability of the Mitscherlich method to the determination of available phosphate in some Iowa soils, C. D. HOOVER and A. G. NORMAN. (Iowa Expt. Sta.). (Soil Sci., 53 (1942), No. 5, pp. 329-340, figs. 3).—Experimentally determined yield curves for oats, obtained by plotting the mean yields of replicate pots treated with successive increments of phosphate, gave reasonable agreement with the logarithmic curves of the Mitscherlich equation. The increases in yield produced by successive increments were not in every case, however, statistically significant. The phosphorus effect factor c , for Victoria-Richland oats was distinctly lower than the constant used by Mitscherlich. Another variety, closely related, gave a value almost twice as great. There was some measure of agreement between the ranking of nine Iowa soils in level of available phosphate as tested by the Mitscherlich procedure with rankings obtained by the chemical availability tests of Truog (E. S. R., 64, p. 312) and Bray (E. S. R., 62, p. 13). Close agreement was found between the results of the Mitscherlich tests on these soils and the responses on the undiluted soils given by successive crops of Sudan grass and wheat in the greenhouse after application of the equivalent of 400 lb. of superphosphate per acre.

To be of practical value under Iowa conditions, the Mitscherlich method should be so modified that the effect factor would be determinable separately in each test. This modification would call for the use of a minimum of 12 pots for each soil instead of 6, and the use of 3 small increments of phosphate to delineate satisfactorily the lower part of the yield curve, or, alternatively, increments each double its predecessor.

A comparison of some methods for the determination of soil organic matter, H. W. SMITH and M. D. WELDON. (Nebr. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 177-182).—The authors determined the organic matter content of 158 soils, using Schollenberger's titration method (E. S. R., 65, p. 504); a modification of Robinson's hydrogen peroxide procedure (E. S. R., 57, p. 310) in the form described by Judd and Weldon (E. S. R., 81, p. 338); wet combustion, an apparatus similar to those described by Adams (E. S. R., 74, p. 299) and by Alexander and Byers (E. S. R., 68, p. 15); and a modification of the Walkley-Black method (E. S. R., 70, p. 742), in which the titration was made with potassium permanganate solution as the only standard.

The proposed change in the Walkley-Black procedure improved the titration by increasing the visibility of its end point. High correlation between the results from the rapid methods and those from the modified Robinson and wet combustion procedure was found, with the exception of the samples to which organic material had been added recently. This exception is not in agreement with the work of Baker (E. S. R., 75, p. 300). It is suggested that data obtained by the rapid methods be reported as found, that is, as milliequivalents of oxidized material per gram of soil. The rapid methods may be used on calcareous soils; the Robinson method cannot be used successfully, and wet combustion necessitates both total and inorganic carbon measurements. The rapid methods are economical of both time and chemicals. The Walkley-Black method is twice as fast and one-half as expensive as Schollenberger's method, its nearest competitor in these respects.

Analysis of plant extracts for chlorophylls *a* and *b* by a photoelectric spectro-photometric method, C. L. COMAR and F. P. ZSCHEILE. (Purdue Univ.). (*Plant Physiol.*, 17 (1942), No. 2, pp. 198-209, fig. 1).—By the simple, rapid, and accurate method described, an acetone extract is made from fresh leaf material (12 plant sources used), the fat-soluble pigments are transferred to ether, the acetone is removed, and the solution dried with Na_2SO_4 . Spectroscopic analysis for chlorophyll *a* and *b* is made at wavelengths 6,600 and 6,425 m. μ . The reliability of values obtained from other wavelengths depended considerably on the carotenoid content. The chemical precautions and instrumental conditions essential for quantitative results are discussed.

The concentration and assay of avidin, the injury-producing protein in raw egg white, R. E. EAKIN, E. E. SNELL, and R. J. WILLIAMS (*Jour. Biol. Chem.*, 140 (1941), No. 2, pp. 535-543).—The avidin assay method described in detail is an adaptation of the yeast method for the determination of biotin. The protein samples to be tested are introduced into sterile biotin solutions, and aliquots are set up in duplicate, the assay of one set being carried out without heat sterilization of the samples. The duplicate set is sterilized by steaming 15 min. at 100° C. This treatment denatures the inactivating protein, and completely releases the biotin. The difference in biotin content between heated and unheated aliquots (as measured by yeast growth) gives a direct measure of the amount of biotin-inactivating protein present in the samples tested. The amounts of biotin in the aliquots are read from curves obtained by plotting the readings given by the biotin standards. One unit is defined as the amount of material capable of inactivating 1 γ of biotin.

Gelatin, edestin, peptone, gliadin, hemoglobin, and tobacco mosaic virus were found to have no biotin inactivating activity. Potent concentrates prepared from fresh egg white did possess such activity, less than 350 parts of some preparations being able to inactivate 1 part of biotin. Avidin was separated from egg white by (1) acetone precipitation of the proteins and extraction of the curds with 2 percent ammonium sulfate in which the active protein was soluble; (2) half saturation with ammonium sulfate and acidification with acetic acid which precipitated the bulk of the proteins but left the avidin in solution; and (3) careful coagulation by heat which removed part of the inactive protein. The first of these three methods proved most satisfactory and is described in detail. The avidin concentrate was relatively heat-stable, responded to certain protein tests, and, judging by solubilities, was neither an albumin nor a globulin.

A quantitative method for assay of tobacco-mosaic virus protein, V. L. FRAMPTON. (Cornell Univ.). (*Phytopathology*, 32 (1942), No. 7, pp. 618-622, figs. 2).—The precipitin reaction may be used in a rapid and accurate determination of tobacco-mosaic virus protein. The amount of N and P found in the precipitate formed in this reaction is proportional to the amount of virus protein added. The ratio of virus protein N to antibody N in the precipitate was found to be 4.8.

Haemoglobinometry, C. RIMINGTON (*Brit. Med. Jour.*, No. 4231 (1942), pp. 177-178).—The method outlined for the determination of total blood pigment involves conversion of all heme pigments present into pyridine-hemochromogen. The intensity of absorption of the latter at about 550 m μ is measured with the Hilger-Nutting photometer, using a suitable filter. From the calibration factor, obtained by using known weights of pure hemin instead of blood, the hemoglobin content of the blood is then calculated. The method is rapid and considered sufficiently accurate for clinical purposes.

The evaluation of fluorophotometers to be used in the thiochrome assay for vitamin B₁, J. R. LOOFBOUROW and R. S. HARRIS (*Cereal Chem.*, 19 (1942), No. 1, pp. 151-168, figs. 8).—Five commercial fluorophotometers of varying design and construction were tested to determine their reliability and precision. It is concluded that "a heating period of 10 to 15 min. is sufficient to attain stable operating conditions in the fluorophotometers tested. All instruments tested have sufficient sensitivity, linearity, and reproducibility of readings to permit the evaluation of thiamin at levels of 0.1 to 1.5 μ g. per 15 cc. of thiochrome solution, with probable errors of the order of 0.0001 to 0.0021 μ g. of thiamin per cubic centimeter of thiochrome solution. The variation in readings due to line voltage fluctuations is of the order of 2 percent per volt at 110 v. in instruments without balanced photocell circuits. This is reduced to the order of 0.1 percent per volt in instruments employing balanced circuits, or in unbalanced instruments when used with line voltage regulating transformers on lines with good frequency regulation. The rate of destruction of thiochrome in these instruments is insufficient to cause serious error in readings, but in two instruments . . . it is high enough to make advisable the taking of readings at a constant time after introducing the sample into the instrument."

The estimation of thiamine in urine, E. EGAÑA and E. P. MEIKLEJOHN (*Jour. Biol. Chem.*, 141 (1941), No. 3, pp. 859-870).—The procedure, described in detail as to reagents, methods, and preparation of standards, consists in general of collection of the urine under acetic acid as a preservative; preliminary washing of the acidified urine, if of low thiamin content, with isobutyl alcohol to remove fluorescent interfering substances; separation of

the aqueous and alcohol layers by centrifuging; adjustment of the aqueous layer to pH 4.2-4.5 with acetic acid, with bromocresol green as external indicator; removal of thiamin by adsorption by rapid filtration of this solution through Decalco; elution of the thiamin by a minimum of shaking of the Decalco with potassium chloride solution in a closed centrifuge tube; treatment of this mixture with the potassium ferricyanide reagent, followed by the addition of the sodium hydroxide solution; extraction of the colored reaction product with isobutyl alcohol; transfer of a portion of the isobutyl alcohol solution, separated by centrifuging, to a Pyrex test tube; and comparison of the fluorescence exhibited in ultraviolet light with that of standards in identical but sealed tubes containing known amounts of synthetic thiochrome dissolved in isobutyl alcohol. The minimum of shaking and the order of adding the reagents prevent overoxidation of the thiamin. On the basis of the tests made, the method is considered applicable to quantities of thiamin varying from 0.2 γ to 2.0 γ in 5 cc. of isobutyl alcohol in the final comparison. With dilutions greater than 1:20,000,000 of thiochrome, an error of about 15 percent is introduced.

The fluorometric determination of riboflavin in urine and other biological fluids, V. A. NAJJAR (*Jour. Biol. Chem.*, 141 (1941), No. 2, pp. 355-364).—The direct procedure described involved acidification of the diluted or undiluted urine with acetic acid, oxidation of interfering fluorescent substances with KMnO_4 , followed by H_2O_2 , and extraction of the riboflavin with pyridine, which was made to separate out as a surface layer by saturation of the aqueous solution with anhydrous Na_2SO_4 . By the addition of butyl alcohol, which is miscible with pyridine but not with water, the separation of the riboflavin from the water phase was made complete. The fluorescence of the pyridine-butyl alcohol solution was measured in a Pfaltz and Bauer fluorophotometer, the observed fluorescence being corrected for that of the solvent by subtracting the fluorescence of the blank in which the riboflavin had been destroyed by exposure to a mercury-vapor lamp or to direct sunlight. The concentration of the riboflavin was determined by comparing the fluorescence of the unknown sample with that of a riboflavin standard, measured at the same time with an exciting light of identical intensity. The direct method was found applicable to urines containing as little as 0.05 γ -0.1 γ of riboflavin per cubic centimeter. By the indirect method, generally recommended for urines containing less than 0.1 γ per cubic centimeter and for those highly pigmented, the riboflavin was adsorbed on freshly precipitated PbS and eluted with a solution consisting of 70 cc. of water, 30 cc. of pyridine, and 2 cc. of glacial acetic acid. The eluate was oxidized, decolorized, extracted with butyl alcohol, and carried through the procedure essentially as in the direct method. Either the direct or the indirect procedure gave satisfactory results with known solutions of different concentrations, and quantitative recovery of riboflavin added to urine samples. Comparative analyses by the indirect procedure and by the bacterial growth method of Snell and Strong (*E. S. R.*, 82, p. 587) showed very satisfactory agreement between the two methods.

Riboflavin analysis of cereals: Application of the microbiological method, J. S. ANDREWS, H. M. BOYD, and D. E. TERRY (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 3, pp. 271-274, figs. 2).—The microbiological method of Snell and Strong (*E. S. R.*, 82, p. 257), applied in direct assay of the solid, finely ground cereal, gave lower values as the weight of the sample was increased. This tendency was decreased but not eliminated by the use of extracts prepared by autoclaving the flour with water and centrifuging. The resulting assay values were materially lower than those obtained by use of the solid

material, but apparently not for lack of thorough extraction of the flavin, since preliminary treatment of the sample with HCl failed to increase the riboflavin content of the extract. Recovery of riboflavin added to the flour greatly exceeded the theoretical, but decreased toward 100 percent as the weight of the sample used was increased. These results indicated that the cereal flour contained factors other than riboflavin that exerted both stimulating and inhibitory influences on the growth of the organism. Treatment of the sample with takadiastase prior to removing the undissolved solids resulted in still lower values than those obtained with simple water extracts. The digested extracts gave uniform values over the range of assay levels employed and in recovery experiments permitted relatively constant recovery at near the theoretical level. The mechanism of these observations was not clear, but evidence was obtained that diastasis of the starch was one factor.

Aqueous and digested extracts were treated with the adsorbent, Florisil (Supersorb), and the eluates examined fluorometrically. Values for the two types of extracts were in fairly good agreement, although the enzymatic hydrolysis appeared to give slightly improved extraction. When the digested extracts were used, results obtained by microbiological and fluorometric procedures were in close agreement and indicated a riboflavin content of 0.35 and 1.03 $\mu\text{g.}$ per gram of patent and whole wheat flour, respectively.

Destruction of riboflavin by light, R. R. WILLIAMS and V. H. CHELDELIN (*Science*, 96 (1942), No. 2479, pp. 22-23).—The destruction of riboflavin in a solution initially containing 0.1 γ per cubic centimeter was determined after exposure of the solution to light under different conditions in which the time, temperature, and pH of the solution were varied. The experiments were carried out in early afternoon on sunny days in a well-lighted room simulating usual kitchen conditions, and the results showed that increases either in temperature or in alkalinity accelerated the destruction of riboflavin at a quite rapid rate. Other tests were conducted in the dark, and no destruction occurred. Fresh skim milk and beaten raw eggs heated in the light at 100° C. for varying periods suffered rapid destruction of their riboflavin contents. The rate of destruction was slower than in clear solutions of riboflavin, and the destruction in eggs was less than in milk. No appreciable destruction occurred when these foods were heated in the dark (closed pan, autoclave). It is pointed out that the opacity of many foods would tend to prevent excessive riboflavin losses during cooking.

Chemical determination of nicotinic acid content of flour and bread, D. MELNICK, B. L. OSER, and L. SIEGEL (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 12, pp. 879-883).—The method, outlined in some detail as to reagents, procedure, readings, and calculations, is based on that of Melnick and Field (*E. S. R.*, 85, p. 584). A water extract obtained by autoclaving a sample suspended in water is concentrated to small volume, treated with an equal volume of concentrated HCl, and after dilution is heated on a boiling water bath to liberate any nicotinic acid from its compounds. The hydrolyzate, treated with absolute ethyl alcohol, is subjected to preferential charcoal adsorption, which removes interfering pigments without removal of nicotinic acid. The filtrate is neutralized and then treated with cyanogen bromide and an aniline solution. The yellow color which results is measured in a photoelectric colorimeter. Calculation is based on a suitable correction for residual interfering color and on the increment in photometric density obtained with a known addition of nicotinic acid to an aliquot of the test solution. This method was shown to be satisfactory in that it gave complete preliminary aqueous extraction, reproducible results, and a high recovery of added nicotinic acid. The specificity of the method for nicotinic acid in cereal products was demonstrated by the fact that the values

obtained agreed very well with those obtained by the microbiological procedure of Snell and Wright (E. S. R., 87, p. 12).

Whole-wheat flours analyzed contained from 5.2 to 6.5 mg. of nicotinic acid per 100 gm.; patent flour from 1.3 to 1.9 mg. The good agreement between calculated and determined nicotinic acid values in a number of breads indicated that only small losses of nicotinic acid occurred during the fermentation and baking processes.

The use of bacteria in the chemical determination of total vitamin C, I. C. GUNSALUS and D. B. HAND. (Cornell Univ.). (*Jour. Biol. Chem.*, 141 (1941), No. 3, pp. 853-858).—The method described is based upon the ability of certain strains of *Bacterium coli* to reduce dehydroascorbic acid to ascorbic acid quantitatively. The procedure, as applied to milk, involves the addition of from 0.5 to 1.0 cc. of a resting suspension of the organism to 10 cc. of milk and incubation at 40° [C.] for 15 min., followed by the addition of 20 cc. of 0.1 N H_2SO_4 and direct titration with 2,6-dichlorophenolindophenol dye to an end point remaining pink for 30 sec. For the determination of total vitamin C in food products other than milk, the extract is brought to pH 6.2-6.6 before reduction, and the bacteria are activated by mixing 1 cc. of the suspension with 1 cc. of 10 percent glucose 15 min. before the addition of the extract to be analyzed. The method is specific for the determination of oxidized ascorbic acid in that no oxidation product other than dehydroascorbic acid is reduced by the organism. However, the oxidation product of *D*-isoascorbic acid is also reduced. Data presented in comparison of the reduction by *B. coli* with reduction by H_2S show agreement between the two methods even in the presence of nonspecific oxidizing agents such as copper or H_2O_2 . Results obtained by application of the bacterial reduction to milk and canned fruit and vegetable juices are given. These data indicate that the method is not applicable to all biological materials, since the organism failed to reduce dehydroascorbic acid added to the sauerkraut and composite vegetable juices, but acted instead as an oxidation catalyst to decrease the ascorbic acid present. The bacterial reduction method was applied satisfactorily to urine.

The determination of vitamin C in urine, G. T. MEIKLEJOHN and C. P. STEWART (*Biochem. Jour.*, 35 (1941), No. 7, pp. 761-769, figs. 3).—The method described for determining the total ascorbic acid in urines was based on that of Scarborough and Stewart,¹ which was modified to carry out the reduction with $SnCl_2$ rather than H_2S ; this permitted the operations of reduction and hydrolysis to be combined and the time for hydrolysis to be measurably shortened. Since the method involved both reduction and hydrolysis of the urine filtrates, that part of the vitamin present as dehydroascorbic acid and also that present in a nonreducing combined form were converted to ascorbic acid, which was determined by an enzymic procedure that served to exclude the effect of certain interfering substances in the final titration with 2,6-dichlorophenolindophenol. The procedure involved acidification of the urine with acetic acid; clearing, if dark or of high specific gravity; reduction and hydrolysis by treatment of the urine, or the filtrate after clearing, with the $SnCl_2$ reagent and refluxing under a stream of N_2 on a boiling water bath for 90 min.; cooling, and clearing by the addition of mercuric acetate solution, followed by precipitation with H_2S . After filtration, an aliquot was set aside for titration after removal of H_2S by aeration with CO_2 , and another aliquot was buffered to pH 6.0 and oxidized enzymically for 30 min. in the presence of autolyzed cucumber juice. The resulting solution was treated with 50 percent HPO_4 and centrifuged, and an

¹ *Biochem. Jour.*, 31 (1937), No. 12, pp. 2232-2239, figs. 3.

aliquot of the supernatant liquid was titrated with indophenol solution. The difference between the results of the two titers, expressed as ascorbic acid and with due allowance for the dilution involved, represented total ascorbic acid in the urine. Some analyses are reported. The scorbutic urines showed very low concentrations of ascorbic acid, and occasionally none was detectable. A few dried vegetables were also analyzed.

Determination of ascorbic acid in whole blood, C. A. KUETHER and J. H. ROE (*Soc. Eept. Biol. and Med. Proc.*, 47 (1941), No. 2, pp. 487-489).—The method, described in some detail, involves removal of the oxyhemoglobin, by reduction through alternate evacuation and treatment with CO, under pressure, before deproteinization with HPO₃. This preliminary step is necessary, since the oxygen set free from the oxyhemoglobin when blood is thus deproteinized serves to oxidize any ascorbic acid present. The filtrate remaining after filtering off the precipitated proteins is analyzed for reduced ascorbic acid by a modification of the method of Mindlin and Butler (*E. S. R.*, 80, p. 728). In nine analyses of normal human blood and normal and scorbutic guinea pig blood to which pure ascorbic acid was added, the recoveries obtained ranged from 90 to 110 percent.

The occurrence of free and bound biotin, J. O. LAMPEN, G. P. BAHLER, and W. H. PETERSON. (*Wis. Expt. Sta.*). (*Jour. Nutr.*, 23 (1942), No. 1, pp. 11-21, fig. 1).—Biotin was determined by a microbiological method employing a strain of *Olostridium butylicum*. This organism, on a basal medium of 2 percent glucose, 0.1 percent asparagine, and 0.11 percent salts, required only the addition of biotin for maximum growth, which took place under anaerobic conditions. Turbidity as read in an Evelyn photoelectric colorimeter was used as a measure of growth. The method, based on these principles and outlined in some detail, was applied to aqueous or acid- or enzyme-hydrolyzed extracts of the material being assayed. The extract was added to the basal medium, the mixture was inoculated and incubated, and the turbidity developed was compared with that developed in an inoculated control tube containing biotin. Only the free biotin was obtained by aqueous extraction; acid, enzyme, or autolytic hydrolysis was required for liberation of bound biotin. Optimal acid hydrolysis was obtained by treatment with 2 N H₂SO₄ for 2 hr.

Assays showing the occurrence of free and bound biotin in a variety of natural materials indicated that the biotin of yeast and animal products occurs chiefly in a water-insoluble, firmly bound combination; that vegetables, green plant materials, and fruits contain a water-extractable form; and that seeds and nuts have considerable amounts of bound biotin.

Isolation of biotin (vitamin H) from liver, V. DU VIGNEAUD, K. HOFMANN, D. B. MELVILLE, and P. GRÖGAY. (Cornell Univ. et al.). (*Jour. Biol. Chem.*, 140 (1941), No. 2, pp. 643-651, fig. 1).—This paper, elaborating upon a preliminary report (*E. S. R.*, 86, p. 12), describes the procedure for the isolation of the methyl ester of biotin from a liver concentrate. This concentrate had been prepared from the alcohol-insoluble fraction of beef liver by high pressure hydrolysis, precipitation of the inert material with alcohol and acetone, and precipitation of the active substance with phosphotungstic acid, followed by decomposition of the precipitate with barium hydroxide. For isolation of the biotin this concentrate was evaporated to dryness, and the gummy residue obtained was esterified by refluxing with absolute methanol containing 5 percent of dry HCl gas; the ester, concentrated in vacuo to a sirupy solution, was washed, neutralized with solid potassium bicarbonate, and extracted with ethyl acetate. This extract, washed with water and dried over sodium sulfate, was taken up in chloroform and further purified by repeated chromatographic adsorption on

aluminum oxide, using an acetone-methanol mixture as the eluent. Eluates of high vitamin H activity, as determined by microbiological assay, were combined and re-esterified, and the ester hydrochloride converted to the free ester which, by repeated crystallization and sublimation, gave crystals possessing a constant biological activity of 27,000 (± 10 percent) vitamin units per milligram and a constant melting point of 166° – 167° [C.]. The analytical data agreed most closely with the empirical formula $C_{31}H_{48}O_8N_4S$.

The preparation of free crystalline biotin, V. DU VIGNEAUD, K. HOFMANN, D. B. MELVILLE, and J. R. RACHELE. (Cornell Univ.). (*Jour. Biol. Chem.*, 140 (1941), No. 3, pp. 763–766, figs. 2).—Free biotin was prepared in crystalline form by saponification of the ester with cold alkali, followed by acidification of the mixture with HCl. The long thin needles that separated were recrystallized from water. The empirical formula was shown to be $C_{30}H_{48}O_8N_4S$. The titration curve corresponded to that of a monocarboxylic acid. No specific absorption in the ultraviolet and near ultraviolet region was found.

The isolation of biotin from milk, D. B. MELVILLE, K. HOFMANN, E. HAGUE, and V. DU VIGNEAUD. (Cornell Univ.). (*Jour. Biol. Chem.*, 142 (1942), No. 2, pp. 615–618).—In the interest of preparing biotin on a larger scale than it could be obtained from liver, as described above, a commercial biotin concentrate prepared from milk and containing from 1 to 2 mg. of biotin per gram of solids was used as the starting material. The method of preparation, described in detail, involved treatment of the concentrate with acidic methanol to give the biotin methyl ester, which was chromatographically adsorbed, first, on Decalco and then on activated alumina. The methanol-acetone eluates from the activated alumina were purified by washing with ethyl acetate, by sublimation in vacuo, and by crystallization from a mixture of methanol and ether. Pure crystalline biotin was obtained from the methyl ester by saponification with dilute alkali and acidification of the saponification mixture with HCl. The yield, based on the biotin concentrate as source material, was from 25 to 40 percent. The method is suitable for the preparation of relatively large amounts of biotin.

The effect of certain reagents on the activity of biotin, G. B. BROWN and V. DU VIGNEAUD. (Cornell Univ.). (*Jour. Biol. Chem.*, 141 (1941), No. 1, pp. 85–89).—Most of the tests were carried out on a crystalline biotin prepared as noted above, using 1- or 2-cc. aliquots of a standard solution containing 12.5 γ per cubic centimeter. The solution was evaporated to dryness, and the reagent added. The reaction mixture, after neutralization and dilution to volume, was tested for biotin activity by the effect on yeast growth. The tests indicated that biotin can be inactivated by vigorous treatment with acid or alkali and by many reagents known to react with α -amino groups, such as nitrous acid, formaldehyde, and chloramine-T; ninhydrin, however, did not affect the activity, and this is interpreted to suggest that biotin is not an α -amino acid. The activity of the biotin was not destroyed by the use of acylating or alkylating reagents. Carbonyl reagents brought about no inactivation, thus indicating the absence of an aldehyde or ketone. Prolonged aeration with air or O_2 had no appreciable effect, but stronger oxidizing agents (H_2O_2 , bromine water) quickly destroyed the activity.

Characterization of the functional groups of biotin, K. HOFMANN, D. B. MELVILLE, and V. DU VIGNEAUD. (Cornell Univ.). (*Jour. Biol. Chem.*, 141 (1941), No. 1, pp. 207–214, fig. 1).—In continuation of work to determine the chemical nature of the active groups of biotin, evidence was obtained that biotin is a carboxylic acid containing an N,N'-disubstituted cyclic urea grouping and possessing sulfur in a thio ether linkage. By alkaline treatment of biotin, a sulfur-containing diaminocarboxylic acid containing 1 less carbon atom and 1 less

oxygen atom was formed. By oxidation of the biotin with H_2O_2 , a sulfone of biotin was prepared. Various derivatives of these compounds were prepared.

A microbiological assay for biotin, G. M. SHULL, B. L. HUTCHINGS, and W. H. PETERSON. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 142 (1942), No. 2, pp. 913-920, fig. 1).—The present method is based on the fact that under proper conditions the titratable acidity produced by *Lactobacillus casei* is a function of the quantity of biotin in the solution. Since the final determination is titrimetric rather than turbidimetric, colored and turbid solutions can be assayed satisfactorily by the method. Stock cultures are prepared and maintained as they are for the use of this organism in the assay of riboflavin by the method of Snell and Strong (E. S. R., 82, p. 587) and of pantothenic acid by the method of Pennington et al. (E. S. R., 85, p. 442). According to the procedure described, the solutions to be assayed or the biotin for the standard curve, prepared by hydrolyzing the methyl ester as described by du Vigneaud et al. (see p. 625), are added to standard tubes containing 5 cc. of the biotin-free basal medium (containing riboflavin and pantothenic acid and other constituents essential for the organism) adjusted to pH 5.6. After adjustment to 10-cc. volume the tubes are plugged, autoclaved, cooled, inoculated, and incubated for 3 days at 37° [C.]. After incubation the contents of each tube are titrated with 0.1 N NaOH, using phenol red or bromothymol blue as indicator. The range of biotin used for the calibration curve is from 40 to 1,000 $\mu\text{g.}$ per tube. The samples to be run are diluted so that their titers do not come at the extremities of the curve, since these give anomalous results. Data showing the recovery of biotin added to different natural products indicate an accuracy of ± 10 percent for the method. Values are reported for the biotin content of a number of biological materials, including several foodstuffs.

A colorimetric oxidation-reduction method for the determination of the K vitamins, J. V. SCUR and R. P. BUHS (*Jour. Biol. Chem.*, 141 (1941), No. 2, pp. 451-464, figs. 3).—The method presented in detail "involves a catalytic reduction of the quinone in butanol solution in the presence of phenosafranine as the indicator. The resulting vitamin hydroquinone is then treated with an excess of a butanol solution of 2,6-dichloroindophenol in the absence of air. The diminution in the color of the indophenol is a measure of the quinone originally present." Raney's nickel serves as the catalyst. The test is carried out in butanol solution, since this increases the stability and spectral purity and doubles the optical density of the 2,6-dichloroindophenol reagent. In analyses of natural materials the vitamin K_1 is extracted with petroleum ether, thus eliminating interfering sugars, thiols, ascorbic acid, and other reducing substances not soluble in petroleum ether. Claisen's alkali (KOH in methanol), added after the catalytic reduction, dissolves the hydroquinone, and the addition of water to the ether-washed alkali hydrolyzes the potassium salts of the hydroquinone. The addition of petroleum ether at this stage serves to extract the vitamin K_1 hydroquinone, while other hydroquinones, including that formed from 2-methyl-1,4-naphthoquinone, remain in the alkaline phase. Readings taken 3 min. after the indophenol reagent is added to the extracted hydroquinone are representative of the reducing activity of vitamin K_1 hydroquinone. The more slowly reducing tocopherylhydroquinones do not interfere in this time interval, since they reach their maximum reducing effect only after from 40 to 60 min. Readings taken after this latter interval serve to give a quantitative measure of the tocopherylquinones and tocopherols.

Changes in flour during storage: Temperature and grade determine storage qualities of flour, J. E. GREAVES (*Farm and Home Sci. [Utah Sta.]*, 3 (1942), No. 2, pp. 4, 7).—Analytical studies of flours stored in 50-lb. sacks for

3 yr. indicated that low-grade flours reach their optimum baking properties more quickly and deteriorate more rapidly than do high-grade patent flours, and that relatively high temperature of storage also accelerates both the attainment and the loss of optimum baking quality. Analytical findings with reference to ash constituents and other components of the flours are given.

A method of "fingerprinting" North Dakota wheat flours in respect to their baking strength, R. H. HARRIS, L. D. SIBBITT, and O. BANASIK (*North Dakota Sta. Bimo. Bul.*, 4 (1942), No. 5, pp. 2-5, figs. 5).—From properties of the remixing curves obtained by means of a recording micro dough mixer on remixing, fermented doughs the authors were able to elaborate a mathematical expression predicting loaf volume with an error within the experimental error of duplicate bakings. It is believed probable that such determinations can replace some of the experimental baking tests on hard red spring wheat flours.

Growing sorghum and making sorghum sirup, C. A. HELM and R. BEASLEY (*Missouri Sta. Cir.* 235 (1942), pp. 7, figs. 3).—Very brief introductory statements concerning choice of variety and soil, seedbed preparation, planting, harvesting, and yield are followed by an outline of the process of sorghum sirup making, accompanied by drawings indicating the equipment needed and its lay-out in the form of a hillside plant in which all movement of the juice and sirup is by gravity.

Chromatographic adsorption analysis, H. H. STRAIN (*New York: Interscience Pubs., Inc.*, 1942, pp. X+222, [pl. 1], figs. 37).—The author stresses mainly the methodology, but includes many specific instances of results given by the chromatographic method. A rather extensive bibliography is appended. The chapter headings are historical introduction, applications of chromatographic adsorption methods, apparatus and procedure, adsorbents, solvents and eluants, location of colorless adsorbed substances, chromatography of inorganic compounds, chromatography of organic compounds, and industrial uses.

Technic for photographing early cleavage stages of the hen's egg, M. W. OLSEN. (Univ. Md.). (*Stain Technol.*, 17 (1942), No. 2, pp. 69-71, figs. 2).—A method involving staining with a gentian violet (defined as a methyl violet 2B) greatly improved the clearness with which the blastodisc could be photographed.

A note on fine needles for dissection, H. G. CANNON (*Jour. Roy. Micros. Soc.*, 61 (1941), No. 1-2, pp. 58-59, fig. 1).—The tip of the fine tungsten wire of which the needles are made is dipped into fused sodium nitrate, in which the tip of the wire burns away with incandescence in from a fraction of a second (when the diameter of the wire is 0.05 mm.) to 1 or 2 sec. (when the diameter of the wire is 0.5 mm.) to leave a perfect needle point. The wire is then mounted in the end of a short piece of nickel tubing (bore of 0.2 mm.), and this in turn is set into the end of a brass handle drilled to receive it and made to fit the microdissector.

An inexpensive apparatus for cutting tissue sections on the sliding microtome by the "dry ice" method, M. V. ANDERS (*Stain Technol.*, 17 (1942), No. 2, pp. 85-87, figs. 2).—A small screw-top tin is adapted for this purpose by coating heavily the bottom of the tin (which is to serve as the freezing surface) with solder, embedding an additional piece of tin plate in the reinforced surface and scoring this added tin plate to form a suitable freezing surface, and providing a simple screw plunger by soldering a nut over a central hole in the lid of the tin of a size such that it will pass the corresponding screw. A stove bolt $1\frac{1}{2}$ in. in length is used as the screw plunger, a piece of tin plate or a cork being attached to provide a surface to press the dry ice up under the freezing surface. A tin $1\frac{1}{4}$ in. in diameter, the size used by the author, may be

attached to the microtome through a 2-in. angle iron, one arm of which is bent about the tin to fit snugly and is soldered in place.

Improved paraffin schedules for plant tissues, T. E. RAWLINS and W. N. TAKAHASHI. (Univ. Calif.). (*Stain Technol.*, 16 (1941), No. 1, pp. 7-8).—The first stage of dehydration in each of the two schedules reported upon consists in placing the tissue in 10 percent glycerol containing 1 cc. per 100 of a 10-percent alcoholic solution of thymol and allowing about 10 to 13 days for evaporation of the water. The tissue is then passed through 1:3, 1:1, and 3:1 mixtures of normal butyl alcohol with glycerol, 24 hr. in each, and through four changes of pure normal butyl alcohol warmed on the paraffin oven. Schedule A then calls for paraffin infiltration from the butyl alcohol, whereas schedule B places the tissue in a 3:1 mixture of this alcohol with cedar oil (clearing grade), evaporates the butyl alcohol from this mixture on the oven, and passes to pure paraffin through 25-, 50-, and 75-percent paraffin solutions in the cedar oil, the first on the oven, the second and third in the paraffin oven. Schedule B usually causes less distortion than A, but staining is not so bright as after A. Either schedule caused less distortion than do those commonly used.

A simple method of transferring tissues, M. W. OLSEN. (Md. Expt. Sta.). (*Stain Technol.*, 17 (1942), No. 2, pp. 73-74, fig. 1).—The tissue carrier shown consists essentially of a perforated metal plate $3\frac{1}{2}$ in. in diameter to which are soldered 35 perforated circular metal bands each $\frac{1}{2}$ in. in diameter and $\frac{1}{4}$ in. deep. Both base plate and bands were made from 30-gage monel metal, having at least 225 perforations per square inch. Other metals can be substituted for the monel but should be plated with a noncorrosible metal.

Two convenient washing devices for tissues and slides, G. H. MICKY and H. TEAS. (La. State Univ.). (*Stain Technol.*, 17 (1942), No. 2, pp. 65-68, figs. 4).—A row of five glass tubes is simply supported over a $5\frac{1}{2}$ - by 10-in. pan, the tops of the tubes being open and the lower ends covered with bolting cloth or cheesecloth. A metal tube longitudinally placed over the row of washing tubes and provided with several small openings over each washing tube distributes wash water to the tubes. An extremely simple washing pan for two large racks of slides was made from another baking pan of dimensions the same as those of the one supporting the washing device.

A section-smear method for plant cytology, H. E. WARMEKE (*Stain Technol.*, 16 (1941), No. 1, pp. 9-12, figs. 3).—The procedure recommended is as follows: Kill root tips in Navashin or other fluid containing chromic acid. Wash, dehydrate, embed in paraffin, and section transversely. Stain slides bearing the sections by a Feulgen technic following the modification of De Tomasi, except that the hydrolysis is prolonged to 45 min. and a 10-min. washing in running water is introduced between the fuchsin and the first bath in sulfite solution. Dehydrate and mount in thin Canada balsam, then apply local pressure to top of cover glass with the tip of a scalpel, while observing the action under low power of a microscope. The prolonged hydrolysis softens the tissue and removes sufficient pectic substance so that cells of the section separate readily and may be flattened until the chromosomes come to lie in a single plane. The slide is permanent.

The plastic ethyl methacrylate in routine laboratory technic, M. S. CARBONE and D. J. ZINN (*Stain Technol.*, 17 (1942), No. 2, pp. 75-78).—The use of ethyl methacrylate as a permanent, transparent, colorless medium for mounting in toto invertebrate and vertebrate embryos and small adults is described in working detail. More than 40 species of animals have been satisfactorily treated in this manner.

The rate of penetration of fixatives, P. B. MEDAWAR (*Jour. Roy. Micros. Soc.*, 61 (1941), No. 1-2, pp. 46-57, figs. 9).—Fixatives penetrating into a plasma coagulum (a substance selected as having the same general physicochemical organization as cytoplasm and intercellular fluid) are shown to obey the diffusion laws within the limits of error of the experiments described. The distance penetrated by fixatives is directly proportional to the square root of the time of fixation, or $x = K\sqrt{t}$. Fixatives neither retard nor facilitate their own entry into the coagulum. The relative rates of penetration of a number of simple and mixed fixatives are tabulated. Values of K , the coefficient of penetration when t is expressed in hours and x in millimeters, were found to be as follows for some of the more commonly used components of fixing reagents: Acetic acid 25 percent, 8.816, 8.9 percent, 7.876; formaldehyde 40 percent, 6.722, 8 percent, 5.875; potassium dichromate 2.5 percent, 4.359; mercuric chloride saturated aqueous solution 4.337, 2 percent, 3.466; chromium trioxide ("chromic acid") 1 percent, 3.599, 0.75 percent, 2.992; osmium tetroxide ("osmic acid") 1 percent, 2.977; picric acid saturated solution 2.503; absolute alcohol 1.714; and uranium nitrate 1 percent, 1.362. The author makes note of the fact that "alcohol penetrates curiously slowly."

Amyl acetate as a clearing agent for embryonic material, H. F. DRURY (*Stain Technol.*, 16 (1941), No. 1, pp. 21-22).—Amyl acetate is soluble in 95 percent alcohol and hot paraffin and produces no hardening in objects exposed to its action for prolonged periods. It may be advantageously employed as a general clearing agent and is especially recommended for refractory material. A schedule has proved satisfactory for whole frog embryos and young tadpoles of 45 min. to 1 hr. in 95 percent alcohol, 24 hr. in amyl acetate, rinse in toluene, 15 min. each in three changes of paraffin, imbed. Material so treated may be sectioned at 5μ with comparative ease.

Romanowsky staining with buffered solutions.—III, Extension of the method to Romanowsky stains in general, R. D. LILLIE (*Stain Technol.*, 16 (1941), No. 1, pp. 1-6).—Solutions of 0.3 gm. of various compound dyes of the thiazine eosinate type in 100 cc. of a mixture of equal volumes of methyl alcohol and glycerol gave satisfactory wholesale staining of sections without differentiation when buffered with citric acid and sodium phosphate. Of compound stains of the indicated type, toluidine blue phloxinate was especially useful. Its preparation is described. The reaction should be pH 4.2 for neutral formalin or Orth fixation, pH 4.6 for acid formalin, pH 5.0 for Zenker formalin, and pH 6.5 for ethyl or methyl alcohol or Carnoy fixation.

Synthetic resins of two commercial types are mentioned as mounting media definitely superior to natural Canada balsam but somewhat inferior to liquid petrolatum with regard to fading.

Alizarin red S and toluidine blue for differentiating adult or embryonic bone and cartilage, T. W. WILLIAMS, JR. (*Stain Technol.*, 16 (1941), No. 1, pp. 23-25).—Specimens are fixed in 10 percent formalin, stained 1 week in a solution of 0.25 gm. of toluidine blue in 100 cc. of 70 percent alcohol, macerated from 5 to 7 days in a 2-percent KOH solution, counterstained for 24 hr. in a 0.001-percent solution of alizarin red S in 2 percent aqueous KOH, dehydrated in cello-solve, and cleared in methyl salicylate. In the adult and embryonic forms thus treated, the soft tissues are cleared, while the osseous tissue is stained red, the cartilage blue.

Studies on polychrome methylene blue.—I, Eosinates, their spectra and staining capacity, R. D. LILLIE and M. A. ROE (*Stain Technol.*, 17 (1942), No. 2, pp. 57-63).—The absorption spectra of eosinates of thiazine dyes in water exhibit absorption maxima at the same spectral locations as do the individual

component dyes in aqueous solution. Commercial samples of Wright's stain showing thiazine absorption maxima between 620 and 660 $m\mu$ generally give satisfactory blood stains. Nuclear staining is redder and cytoplasm grayer blue in 620-640 range, and consequently staining of malaria parasites is less satisfactory in that range. The best malaria stains show their thiazine absorption maxima usually between 650 and 660 $m\mu$. Successive batches of Wright's stain made by the same manufacturer, as well as experimental laboratory lots, may show wide variations in their thiazine absorption maxima and in their staining characteristics.

The reaction of certain stains with bacteria, T. M. McCALLA. (Kans. Expt. Sta.). (*Stain Technol.*, 16 (1941), No. 1, pp. 27-32).—The author presents experimental observations supporting the view that staining is an adsorption exchange reaction and is, therefore, more of a chemical than of a physical nature. Displacement of magnesium from cells of *Escherichia coli* and of *Staphylococcus aureus* was shown, as was the replacement of the H ions of hydrogen-saturated cells by crystal violet, safranin, methylene blue, and basic fuchsin in the cells of various organisms. The effect of the acid stain phloxin upon the pH value of a suspension of *E. coli* also supported the author's view of the chemical mechanism of staining reactions.

P-aminodimethylaniline monohydrochloride as an indicator of microbial action on fats, C. H. CASTELL (*Stain Technol.*, 16 (1941), No. 1, pp. 33-36).—The marked changes in the colors of the fat globules in a fat emulsion agar medium inoculated with certain types of micro-organisms were found to result from the increased solubility in fat and fatty acids of this dye as it becomes oxidized. Some of the acids oxidize the dye on contact and therefore color very quickly; fats become colored only when some other agent oxidizes the dye. A table showing the colors in globules of oil that were inoculated with 39 pure cultures of bacteria is included.

Staining bacteria and yeasts with acid dyes, W. E. MANEVAL. (Univ. Mo.). (*Stain Technol.*, 16 (1941), No. 1, pp. 13-19).—Acid dyes found satisfactory for the routine staining of bacteria were acid fuchsin, aniline blue w. s., fast acid blue R, fast green FCF, light green, orselline BB, erythrosin, phloxin, and rose bengal. Acid fuchsin, fast green, aniline blue, and orselline are especially recommended. Phenolic solutions of the dyes, acidified with acetic acid, with the addition of ferric chloride to those containing acid fuchsin, aniline blue, fast green, or light green, were used. Staining procedures for a variety of bacteriological purposes are detailed. The principal advantages of acid dyes are better differentiation and less tendency of slime and debris to take the dye.

AGRICULTURAL METEOROLOGY

The quantity of vaporous water in the atmosphere, C. G. ANBOT (*Smithson. Misc. Collect.*, 101 (1942), No. 12, pp. [1]+7).—The applications of a spectrobolometric method, as practiced by the author, to determine how thick a stratum of liquid water would be produced if all the water vapor in the atmosphere could be instantaneously precipitated are described and formulas presented. In this study there was found no general relationship or certain connection between the march of precipitable water from day to day and the fall of rain, and certainly no definite change of precipitable water considerably antedating rainfalls which could serve for forecasting their times and amounts. This is believed to support the view that the approach of a rainstorm is not accompanied by any considerable transport of water from the direction whence the storm comes. What occurs is a traveling disturbance of the atmosphere, which, as it reaches successive

localities, draws together from short distances aqueous vapor already suspended within the atmosphere in those regions. This view is supported by the observation that on the next day following a rainfall the precipitable water is apt to be less than that which usually prevails at that time of the year.

Hail in high and low latitudes, H. LEMONS. (Okla. A. and M. Col.). (*Amer. Met. Soc. Bul.*, 23 (1942), No. 2, pp. 61-68).—The author discusses hail of low latitudes, where it is infrequent, and hail of high latitudes, including Canada and Alaska.

The development and expansion of daily weather forecasting for the Susquehanna River basin, O. L. ROCK (*Pa. Acad. Sci. Proc.*, 15 (1941), pp. 125-128, fig. 1).

Water studies will aid farmers in planning for larger acreages of war-needed crops, H. G. WILM. (U. S. D. A. coop. Colo. Expt. Sta.). (*Colo. Farm Bul.* [Colorado Sta.], 4 (1942), No. 2, pp. 19-20, fig. 1).—Preliminary records taken on a series of plats established in a stand of mature lodgepole pine located on a mountain watershed indicated that the storage of snow during winter increases after timber cutting. Before melting began in 1941 an average of 7.75 in. of water was measured in the snow on the commercially clear-cut areas (10-in. minimum) as compared with 5.33 in. on uncut stands. Both areas became bare of snow at about the same time. Losses of summer rainfall through interception and evaporation from the crowns were found to be rather comparable to the losses of snow during winter.

Indice de variabilidad climatica [Index of climatic variability], W. KNOCHE and V. BORZACOV (*An. Soc. Cient. Argentina*, 133 (1942), No. 4, pp. 279-292).

Indications as to climatic changes from the timberline of Mount Washington, R. F. GRIGGS (*Science*, 95 (1942), No. 2473, pp. 515-519).—An address.

Climatological data for the United States by sections, [January-December 1941] (U. S. Dept. Com., *Weather Bur. Climat. Data*, 28 (1941), Nos. 1-12, [about 225 pp., 2 pls., 8 figs. each]).—These numbers contain the usual brief summaries and detailed tabular statements of climatological data for each State.

Maps of seasonal precipitation percentage of normal by States, fifty-three years, 1886-1938; tables of normals and 10 wettest and 10 driest seasons and years (U. S. Dept. Com., *Weather Bur.*, 1942, pp. [1]+76, figs. 53).

Fruit diseases and the weather in 1941, O. C. BOYD (*Mass. Fruit Growers' Assoc. Rpt.*, 48 (1942), pp. 109-112).—Rainfall and temperature records in Massachusetts for March to October 1941 are presented, and weather conditions in relation to diseases of small fruits, stone fruits, and apple (scab), and to spray injury are briefly discussed.

[Meteorological conditions in the 1940-41 season in Idaho] (*Idaho Sta. Bul.* 244 (1942), pp. 18, 58, 60).—Notes are presented by K. H. W. Klages, R. E. Knight, and W. A. Moss on the high winter temperatures, heavy precipitation, and high variability of climatic conditions at the station and substations.

Proceedings of the Hydrology Conference, held at State College, Pennsylvania, June 30 to July 2, 1941, edited by F. T. MAVIS (*Pa. State Col., School Engin. Tech. Bul.* 27 (1942), pp. VIII+270, figs. 67).—The following papers are included: Scope of the Hydrology Conference, by L. G. Straub (pp. 1-2) (Univ. Minn.); Application of Hydrology in Flood Control, by G. A. Hathaway (pp. 3-40); The Relation of Hydrology to the Third Locks of the Panama Canal, by H. W. Brod (pp. 43-54); An Outline of the Runoff Cycle, by W. G. Hoyt (pp. 57-67); Development of Climatological Records of the United States, M. Bernard (pp. 71-81); Some Aspects of Subsurface Water in Hydrologic Research on Agricultural Watersheds, by H. S. Riesbol

(pp. 85-108) (U. S. D. A.); Looking Ahead at the Weather, by W. F. McDonald (pp. 118-118); Some Aspects of Infiltration in Relation to Runoff, by G. W. Musgrave (pp. 119-134), and The Application of Our Knowledge of the Organic Layers of the Soil Profile to Flood Control, by H. F. Morey (pp. 143-148) (both U. S. D. A.); The Melting Characteristics of Snow and Its Contribution to Runoff, by W. T. Wilson (pp. 153-165); Application of Hydrology to Soil and Water Conservation, by C. E. Ramser (pp. 167-182), and The Measure of Evaporation and Transpiration From Natural Surfaces, by C. W. Thornthwaite (pp. 185-187) (both U. S. D. A.); Laboratory Techniques in the Study of Floods, by H. A. Thomas (pp. 190-212); The Mississippi River Flood Control Model, By K. E. Fields (pp. 213-230); Flood Forecasting in Pennsylvania, by G. Weber, Jr. (pp. 231-249); The Flood of September 1938 at the Big Eau Pleine Dam in Wisconsin, by A. T. Lenz (pp. 255-262) (Univ. Wis.); and Pure and Applied Hydrology—An Integration of Objectives, by L. K. Sherman (pp. 263-267).

Hydrologic data: Blacklands Experimental Watershed, Waco, Texas, 1937-1939 (U. S. Dept. Agr., *Hydrol. Bul.* 2 (1942), pp. IV+197, pls. 2, figs. 44).

Hydrologic data: Central Great Plains Experimental Watershed, Hastings, Nebraska, 1938-40 (U. S. Dept. Agr., *Hydrol. Bul.* 3 (1942), pp. II+148, pls. 2, figs. 13).

SOILS—FERTILIZERS

[Soil investigations by the Idaho Station] (*Idaho Sta. Bul.* 244 (1942), pp. 19, 33-34).—Soil management practices are recommended by G. O. Baker and E. VanSlyke, organic matter was shown by R. S. Snyder and Baker to be important in crop production, and the stage of decomposition of organic matter was shown to influence degree of sorption by clay material. Various factors were found by L. E. Eusminger to affect alkalinity of southern Idaho soils.

[Soil and fertilizer work in Mississippi] (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), Nos. 5, p. 2; 6, p. 1).—These two numbers contain the following brief popular articles: No. 5.—Farm Manure: A Crop Worth Caring for, by E. B. Ferris; No. 6.—Phosphate: Costly, Needed, Valuable Plant Food Source, by R. Coleman.

[Soil Survey Reports, 1933 and 1936 Series] (U. S. Dept. Agr., *Bur. Plant Indus., [Soil Survey Rpts.]*, Ser. 1933, No. 37, pp. 99, pls. 3, figs. 3, maps 3; 1936, No. 12, pp. 71, figs. 3, map 1).—These surveys were made in cooperation with the North Dakota and Michigan Experiment Stations, respectively: 1933, No. 37, McKenzie County, N. Dak., M. J. Edwards et al.; and 1936, No. 12, Clinton County, Mich., G. A. Johnsgard et al.

The identification of the clay minerals in five Iowa soils by the thermal method, M. B. RUSSELL and J. L. HADDOCK. (Iowa Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 90-94, figs. 2).—Thermal curves for several pure clay minerals, clay mineral mixtures, and colloids extracted from five Iowa soils were determined by a method devised for use in ceramic technology. The minerals present in the extracted colloids were identified by comparing thermal curves of the colloids with similar curves for pure clay minerals and clay mineral mixtures. All the colloids studied contained high percentages of montmorillonite and a much smaller quantity of kaolinite. The illite content of the soil colloids could not be estimated from the thermal curves but was calculated from the potassium content of the colloids. The prominence of the 225° C. endothermic montmorillonite reaction gave some indication of the degree of base saturation of the

five soils studied. The average estimated percentages of montmorillonite, illite, and kaolinite for the five soils based on the thermal curves, chemical composition, and base exchange capacity data were 60, 30, and 10 percent, respectively.

The thermal method as a quantitative measure of clay mineral content, G. M. SCHAFER and M. B. RUSSELL. (Iowa Expt. Sta.). (*Soil Sci.*, 53 (1942), No. 5, pp. 353-364, figs. 4).—Each of the clay minerals was found to have a characteristic thermal curve, useful for the identification of the mineral. The curve of each mineral can be reproduced readily. There are, however, small variations in the curves of different samples of the same mineral. The thermal curves of montmorillonite are affected by the exchangeable bases present, and it is important to know the base status of a mineral mixture when interpreting its thermal curve. The thermal curves for hydrated halloysite and halloysite were found to have two distinct endothermic reactions occurring at the same temperatures. For each of these minerals the ratio of the areas of the two peaks was found to remain constant for all determinations. The ratio of the areas could be used for determining the area of one peak if the area of the other peak was known. The endothermic peak at 320°-350° C. for these two minerals occurs at the same temperature as does an endothermic peak of gibbsite. The areas of the endothermic peaks of dilutions of the clay minerals with alumina were measured and found to be proportional to the areas of the peaks of the pure minerals. The agreement was particularly good for the sample of montmorillonite used. The areas of the peaks were less reliable for the small samples of kaolinite and hydrated halloysite. Good agreement with the actual amounts present was obtained for the kaolinite-hydrated-halloysite mixture and for montmorillonite in the montmorillonite-kaolinite mixture. Thermal curves of the montmorillonite-hydrated-halloysite mixture were not satisfactory for estimating the amounts present.

Effect of submergence on a Podzol soil profile in the Adirondack forest, T. H. EATON, JR. (Cornell Univ.). (*Soil Sci.* 53 (1942), No. 5, pp. 379-383, fig. 1).—A shallow artificial reservoir about 0.7 mile long and 0.4 mile wide in the Huntington Wildlife Forest Preserve, Newcomb, N. Y., was produced about 1912 by damming. About 1926-28 the wooden dam failed and much of the water went out. The last of the water was let out in 1939.

The occurrence of a typical Podzol profile in an area which had been cleared of all timber and then flooded for 15 yr. is demonstrated from the results of a detailed profile examination, showing a resistance to change in spite of this interference with the normal processes of drainage and leaching, and also showing some special effects of submergence. A diagram shows the Podzol profile below the former lake to be continuous, except for erosion at the beach line, with that of the unaffected forest. In addition to the soil structure observations, counts of arthropods and annelids in the humus layer both of the formerly submerged soil and of the adjacent Adirondack forest soils which had not been submerged were made.

Observations and studies on the peat deposits of Louisiana, W. R. DODSON (*Louisiana Sta. Bul.* 343 (1942), pp. 27, figs. 7).—Because war transportation difficulties have cut off the supply of foreign peat, formerly used extensively in this country for soil improvement, this bulletin brings together the preliminary information on peat resources in Louisiana, with the hope that it may lead to the development of the available resources and stimulate work to learn more about the value of the peat materials of the State. Discussions of the importance and uses of peat and of peat deposits in the United States and in Louisiana are included, as well as a detailed description of the *Sagittaria* peat of the Grand Marais and Lake Tasse areas.

Pressure and streamline distribution in waterlogged land overlying an impervious layer, D. KIRKHAM. (Utah Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 65-68, figs. 7).—The author obtained photographs of streamline flow patterns by placing wire gauze models of tile drains in uniform sand and in stratified soil layers held in tanks having plate-glass fronts at right angles to the drains, the water being colored by potassium dichromate. An impervious layer was placed at various depths below the soil surface. Photographs of flow in models representing various depths and spacings of the drains are reproduced, and their significance is briefly discussed.

Physical and chemical properties of soil profiles of the Scott, Fillmore, Butler, Crete, and Hastings series, H. W. SMITH and H. F. RHOADES (*Nebraska Sta. Res. Bul.* 126 (1942), pp. 43, figs. 10).—A revision of the Grundy and a part of the Scott soils, resulting in the differentiation of the Fillmore, Butler, Crete, and Hastings series, is summarized. Complete profiles were sampled in the new series—1 from the Scott, 2 from the Fillmore, 6 from the Butler, 2 from the Crete, and 1 from the Hastings series. Samples were also taken from the A and upper B horizons of 5 profiles, 1 from the Crete, and 4 from the Butler series. The physical properties determined for the samples from the complete profiles were hygroscopic coefficient, moisture equivalent, lower plastic limit, and liquid limit. Volume weight determinations were made in the horizons of 9 profiles. Liquid limit, hygroscopic coefficient, and moisture equivalent determinations were made for the samples from the 5 shallow profiles. For all samples from the complete profiles, oxidizable material, pH, carbonate content, exchange capacity, and total nitrogen, together with exchangeable calcium and magnesium for noncalcareous samples, were obtained. Exchangeable sodium and potassium were determined for 18 selected samples. Relative humus color was determined for 13 selected samples. The data concerning the physical and chemical characteristics of the soils of the different series were combined to give profiles with a maximum of 6 horizons.

The lack of a clay pan in the Hastings profile was used in the field to differentiate the soils of that series from those of the Crete. The definite character of this separation was apparent from the hygroscopic coefficient, moisture equivalent, liquid limit, plasticity index, and total exchange capacity data for the B horizons of the profiles representing these series. From the laboratory data obtained for soils of the Crete and Butler series, as the latter have recently been mapped in Lancaster County and elsewhere, no line could be drawn separating the two. The suggestion is made that the name Butler is now being applied where Crete should be the preferred series designation. Butler could then be reserved as a name for those soils with a definite sprinkling of gray in the lower topsoil and with a dark grayish-brown pan. This would conform with the original description of soils of the Butler series. Type locations of Butler soils which have this morphology were observed and sampled. Data for the hygroscopic coefficient, moisture equivalent, and liquid limit of these samples support the suggested limitation of the name Butler to soils of these characteristics. In the field, Fillmore soils were separated from those of the Butler series largely on the basis of the presence of iron concretions in the clay pan of the former. Judging from the profiles studied, the authors find that the two could be separated more satisfactorily on the basis of the intensity and thickness of the gray layer. The presence of a gray layer was shown to be correlated with a profile development different from that found when the gray layer has not formed. These differences are shown by the data from the following determinations: Hygroscopic coefficient, moisture equivalent, liquid limit, exchange capacity, pH, and percentage saturation by calcium plus magnesium. The profiles of the Crete,

Butler, and Fillmore series were similar, with the least noncapillary pore space in the clay pan. Among these profiles the Fillmore clay pan had the least such pore space. The Scott profile exhibited a low noncapillary pore space throughout the subsoil. Some new data concerning the gray layer in the A_2 of the Fillmore and Scott series are presented.

The effect of soil texture and slope of land on productivity in two North Dakota counties, W. M. JOHNSON and C. F. BORTFELD (*North Dakota Sta. Bul. 315 (1942), pp. 22, figs. 5*).—Investigations reported in this bulletin were directed to obtain more specific data on the effect of physical characteristics of the land on productivity. A method is explained for determining the effect of a variety of surface soil textures and slope classes on the yield of common crops. Application of the procedure is discussed in relation to selected areas in Pierce and Walsh Counties. Economic factors, such as status of farm operators, assessed valuation, tax delinquency, and mortgage on the different land conditions, are also determined. In both counties the heavy-textured soils were found to be superior to the light-textured soils for most crops, but the authors point out that the highest yields of most crops were not associated with the same texture class in both counties. Slope was found to influence yields of crops in both counties but in different ways and to a smaller degree than texture. Assessed valuations of lands in both counties were closely associated with general productivity level. Mortgage indebtedness data could not be clearly related to other economic data or to soil productivity.

The productive capacity of semiarid soils and the present emergency, W. T. McGEORGE (*Arizona Sta. Bul. 182 (1942), pp. [4]+463-496*).—Restoration of good soil structure and maintenance of maximum productivity require, in Arizona, (1) the use of soil correctives for maintaining freedom from alkali and for reclaiming soils already injured by alkali; (2) the use of animal manures and organic farm waste, returning to the soil as much as possible of the organic material which the soil itself has produced; and (3) the use of soil analysis for developing a program of fertilization. These three phases of the productivity problem are dealt with separately in this bulletin.

The first of the three articles takes up leaching and the use of gypsum, sulfur, and organic matter, and combination methods of reclamation. The usual reclamation methods are discussed, with special emphasis on the structure as more important than the complete removal of salinity or alkalinity and on the use of sulfur or sulfur and gypsum with organic mulching materials. The second article is concerned with the composting methods best adapted for use in semiarid areas. The third article discusses the relation between chemical determinations of the phosphate, nitrogen, and potassium of the soil and its fertility and fertilizer needs. For determining the quantities of these nutrients actually available to plants, the preferred method consists in saturating a suspension of the soil with carbon dioxide and estimating colorimetrically the phosphate, nitrate nitrogen, and potassium of the resulting solution. The importance of establishing correlations between analytical data and fertilizer response by fertilizer experiments on a large number of types is pointed out.

Effect of irrigation waters and cropping on the nutrients and exchangeable bases of desert soils, C. W. BOTKIN and E. C. SMITH (*New Mexico Sta. Bul. 292 (1942), pp. 28, figs. 8*).—The authors report profile studies on the effects of cropping and of the composition of irrigation water on the exchangeable bases and the available nutrients of desert soils under irrigation. The desert soils cropped under irrigation increased somewhat in nitrates and remained at a nitrate level higher than that of the virgin soil, of which the organic matter was normally low. The available soil potassium decreased under cropping, with one

exception, but the potassium level remains high and the irrigation waters supply considerable quantities of this nutrient. There is no indication that cropping will exhaust the potassium supply of any of these soils. Total base exchange capacity was not greatly altered by irrigation and cropping. In general, base exchange capacity varied with the clay content in the soil profile. In certain soils a downward movement of clay was indicated. A ratio of divalent bases (calcium+magnesium) to monovalent bases (sodium+potassium) in the irrigation water of one to one or more was found to result in little change in the exchangeable bases of the soil, whether the concentration of soluble matter in the water was high (3,855 p. p. m.) or low (242 p. p. m.). A ratio of from 0.12 to 1.00 resulted in a considerable increase in exchangeable sodium in a soil that had been under irrigation for 25 yr., although the water had a low concentration of soluble matter and the soil contained a high percentage of calcium carbonate. It is believed that under less favorable conditions the soil would probably have been seriously injured. The desert soils studied were found comparatively high in exchangeable calcium, magnesium, and potassium and to have an unexpectedly high level of available nutrients after from 25 to 40 yr. of cropping under irrigation. The waters of the major irrigation projects were found to have a balance of bases favorable to continued tilth and fertility. All of these conditions favor the permanency of agriculture under irrigation.

The application of delignifying procedures to soil organic matter, A. G. NORMAN and J. E. MOODY. (Iowa Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 171-176, fig. 1).—The effect of a number of delignifying procedures upon the organic matter of surface samples of an Ames and a Webster soil was ascertained by the determination of the reduction in organic carbon as determined by the Robinson, McLean, Williams method (E. S. R., 64, p. 312) and change in susceptibility to hypodlite oxidation, determined according to the procedure of Norman and Peery (E. S. R., 85, p. 438).

Although both soils were formed under similar climatic conditions and contained organic matter of approximately the same C:N ratio, distinct differences were apparent, relatable to the nature of the parent vegetation. The organic matter in the Webster soil, prairie-derived, was more resistant to all extracting agents, was less susceptible to oxidation by hypodlite, had a higher exchange capacity, and was biologically less available than that in the Ames. Though the application of delignifying procedures brought about extensive removal of organic carbon, the behavior of the residues indicated that the grouping oxidizable by hypodlite and believed to be a lignin component in many cases remained behind. If, therefore, a major fraction of the organic matter is predominantly lignin-derived, the processes of decomposition reduce its ability to undergo such reactions as normally bring about solution.

The action of some mesophilic bacteria on cellulose, A. G. NORMAN and W. V. BARTHOLOMEW. (Iowa Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 242-247).—Active fermentation of cellulose by aerobic mesophilic bacteria was not accompanied by any evidence of oxidative attack. Uronic groups, if present, seem to be decreased, not increased. Pentosan material associated with the cellulose was preferentially fermented. A polyuronide gum of bacterial origin was obtained from each of the seven organisms studied. The presence of uronic residues in soil may be due in part to synthetically produced polysaccharides of this nature.

* Nitrogen studies on the western Kansas branch experiment stations, H. E. MYERS. (Kans. Expt. Sta. coop. U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), p. 237).—The trend of the nitrogen content of dry-land soils follows the same general pattern as is characteristic of humid soils. After approximately

40 yr. of cropping, these soils have apparently not reached an equilibrium though the rate of decrease has become progressively slower. Whether the nitrogen level at the equilibrium point will be adequate for maximum crop production cannot be answered on the basis of present information.

Continuous small grains resulted in the smallest loss of nitrogen. The alternate small grain and fallow system caused losses only slightly larger. Alternate row crop and fallow resulted in the lowest nitrogen level, followed closely by continuous row crop and that by rotations including row crops. In a sod area the nitrogen content remained constant over the period studied. Return of organic matter in any form increased the residual soil nitrogen content, even straw effecting a measurable improvement.

Inoculation of soil with *Azotobacter chroococcum*, J. E. GREAVES and L. W. JONES. (Utah Expt. Sta.). (*Soil Sci.*, 53 (1942), No. 3, pp. 229-232).—A typical dry-farm soil free from *Azotobacter* was inoculated with *A. chroococcum*, variously treated with calcium carbonate and organic manure, and kept bare in a greenhouse for 17 yr. and under wheat 2 yr.

During the first 12 yr. of the experiment, inoculated soil when added to a synthetic mannite medium and incubated for 21 days fixed much larger quantities of nitrogen than did uninoculated soil. At the end of 19 yr. all soils had become contaminated with *A. chroococcum* and all fixed approximately the same quantities of nitrogen. The average annual gain of nitrogen per acre-foot varied from 27 to 38 lb. The uninoculated soil became contaminated with *Azotobacter* sometime during the first 12 yr. of the experiment. It cannot be said definitely, therefore, that inoculation of this soil with *Azotobacter* will increase its nitrogen content. There was definite evidence, however, that the addition of organic manure to the soil increased the quantity of nitrogen gained. It is believed that the gain was due primarily to the activities of nonsymbiotic nitrogen-fixing micro-organisms. It is shown that the absence of *Azotobacter* from this soil is not caused by an unfavorable environment.

Methods of observing soil flora and fauna associated with roots, M. B. LINFORD. (Univ. Hawaii). (*Soil Sci.*, 53 (1942), No. 2, pp. 93-103, pls. 3).—Direct observations, at magnifications up to 900 diameters, of organisms associated with roots growing in soil are possible where roots are grown in contact with a glass cover slip. Small seedlings may be grown a few days in observation chambers made by cementing cover slips to glass rings. These chambers are inverted on the microscope stage for examination. Observations of roots of larger plants and over longer periods are possible where cover slips are cemented over openings in the sides of miniature root-observation boxes of the type described earlier by the author (E. S. R., 83, p. 205). Observation is with cooled incident light. This method enables observation and photographic recording of living bacteria, actinomycetes, fungi, protozoa, and nematodes on and about the root. The glass sides of the observation boxes may be stained as contact slides. When processing roots in lactophenol with an appropriate stain, where interest centers in organisms on the root surface, it is recommended that unwashed roots be fixed in formalin acetic alcohol, and that they be processed in lactophenol without washing or with the least washing that will permit observation of the necessary details. In this way many micro-organisms and nematodes that are lost by a preliminary wash are retained among the root hairs or on the root surface. A brief period of staining after the roots are clear brings out surface details while retaining transparency. The use of these methods with roots of four plant species has shown that varied bacteria become numerous in intimate association with very young roots, down to the apical meristem, and that protozoa and microphagous nematodes congregate and multiply here. The view that microbial activity in

the rhizosphere is related chiefly to destruction of senescent cells is shown to be inadequate.

The response of soil micro-organisms to added plant food on major soil types in Indiana (*Indiana Sta. Rpt. 1941, p. 51*).—Studies by J. L. Roberts and F. R. Olson are briefly noted.

Erosion losses of major plant nutrients and organic matter from Collington sandy loam, H. C. KNOBLAUCH, L. KOLODNY, and G. D. BRILL. (N. J. Expt. Stas. and U. S. D. A.). (*Soil Sci., 53 (1942), No. 5, pp. 369-378*).—Soil organic matter and plant nutrient losses from Collington sandy loam used for vegetable production under the conditions of the New Jersey Coastal Plain were reduced by the use of a rye cover crop, as by the application of 20 tons of manure annually, and markedly by both treatments combined. Losses of organic matter and plant nutrients from the check plots, which lost 26,000 lb. of soil from June 12, 1938, to December 31, 1940, were 1,149 lb. of organic matter, 67 of nitrogen, 154 of phosphoric acid (calculated as the anhydride), 515 of potassium oxide, and 141 lb. of calcium oxide. An application of 20 tons of manure per acre each year combined with a rye cover crop reduced soil losses to 7,260 lb., with other losses as follows: 337 lb. organic matter, 19 nitrogen, 40 phosphoric acid, 118 potassium oxide, and 35 lb. of calcium oxide per acre. Average losses of organic matter and plant nutrients from the four treatments showed that 4.20 times as much organic matter, 3.90 times as much nitrogen, 1.52 times as much phosphoric acid, 1.38 times as much potassium oxide, and 2.33 times as much calcium oxide were lost in the eroded material as were present in the plowed layer of Collington sandy loam.

Erosion on Vermont permanent pastures, A. R. MIDGLEY, C. V. PLATH, and J. J. MAYERNIK. (Coop. U. S. D. A.). (*Vermont Sta. Bul. 483 (1942), pp. 15, pls. 4, figs. 3*).—Sheet erosion is not a major factor on Vermont permanent pastures. It is not appreciable even on very steep slopes, provided the vegetation has not been so damaged as to lead to active gullyng. On the lighter soil types even a spare moss and weed cover serves to check the water run-off. The largest water losses occur when accumulated snows thaw. Gullies form somewhat readily on the lighter soil types at points where the turf breaks, because of overgrazing or from other causes, where the vegetative cover is poor. Contour furrows seem to be of little avail with light soil types but may be of some service on the more retentive soils.

These conclusions were drawn from detailed observations throughout the State, from erosion investigation plats on Hartland silt loam of 16-percent slope and on Hartland sandy loam of 27-percent slope, and from run-off and soil loss measurements on Hartland silt loam pasture land of 47-percent slope, as well as on the Woodbridge, Adams, and other soils at lower and higher slope percentages. Very little erosion occurred on pasture lands even of 50-percent or greater slope, except these steep slopes were too heavily grazed. Stream-bank erosion seemed the most serious form of soil loss in Vermont, and much work has already been done to check such bank cutting (E. S. R., 81, p. 339).

Conservation and better land use for Oklahoma, H. A. DANIEL, H. M. ELWELL, and H. F. MURPHY. (Coop. U. S. D. A.). (*Oklahoma Sta. Bul. 257 (1942), pp. 53, figs. 23*)—The most effective method of controlling erosion was with thick-growing vegetation, especially grass. Native prairie grasses reestablish themselves on eroded land slowly, but this process can be greatly accelerated in central Oklahoma by the use of legumes, such as sweetclover and sericea lespedeza, heavily fertilized. During the last 3 yr. the production of beef on formerly useless, abandoned, scrubby oak land compared favorably with that on the range land. In comparisons of a livestock system, a grain system, and a commercial fertilizer

system, the best results were obtained when all crops except lint cotton were fed to livestock and the manure produced returned to the land with additional lime and phosphorus. Land submarginal for cultivation may be more stable and capable of greater returns when put to its most desirable use. For arable lands, terracing to conserve both soil and water, together with crop rotation, cultivating on the contour, and conservation of all returnable organic matter constitute the recommended practices.

Save your soil (*U. S. Dept. Agr., Soil Conserv. Serv., Conserv. Folders 1* [1941], pp. [5], *figs.* 2; 2, pp. [5], *figs.* 2; 3, pp. [5], *figs.* 2; 4, pp. [5], *figs.* 2; 5, pp. [5], *figs.* 2; 6, pp. [5], *figs.* 2; 7 [1942], pp. [5], *figs.* 2; 8, pp. [5], *figs.* 2; 9, pp. [5], *figs.* 2; 10, pp. [5], *figs.* 2; 11, pp. [5], *figs.* 2; 12, pp. [5], *figs.* 2; 13, pp. [5], *fig.* 1; 14, pp. [5], *figs.* 2).—A series of folders describing practical methods for the conservation of soil and water for farmers and ranchers of the northern Great Plains on the following subjects: Contour strip cropping saves both soil and water; protected waterways in cultivated fields; wildlife and soil conservation go hand in hand; range improvement by proper stocking; strip cropping for control of wind erosion; save soil, moisture with contour tillage; establishing grass on unproductive cultivated land; stock-water dams in the northern Great Plains; stock-water dugouts an aid to range management; water spreading and flood irrigation; developing springs to furnish water for livestock; tree shelterbelts or windbreaks helpful on the northern Great Plains; protection and care of farm woods; and tree planting to stabilize gullies and stream banks.

Teamwork to save soil and increase production, P. A. WARING (*U. S. Dept. Agr., Misc. Pub. 486* (1942), pp. [66], *figs.* 37).—An illustrated publication showing the development, adoption, and resultant benefits of soil and water conservation practices by a group of farmers in the watershed of Honey Hollow Creek, located in Bucks County, Pa.

Resting the land for future gains, H. R. COX (*New Jersey Stat. Cir. 435* (1942), pp. 16, *figs.* 8).—This circular stresses the value of maintaining or increasing the organic matter or humus content of the soil by (1) growing green-manure crops, (2) applying various organic materials, and (3) conserving crop residues. Green-manure crops, especially winter cover crops, are of value in this territory, particularly in preventing erosion by wind and water. Among organic materials still available are salt hay, peat, pine needles, refuse from wasteland, and mulch materials produced on the farms. Among the crop residues of most importance in maintaining organic matter are sods of grass, clover, and alfalfa. Successful stands of these crops not only furnish the hay and pasture necessary for livestock but their residues have a most favorable effect on the crops following. It is estimated that resting one-fourth of the land under cultivation would require increasing the yield of the remaining three-fourths only by from 10 to 15 percent because of the cost saved in fertilizer, seed, and other expenses, and that more than this increase should be obtainable, raising the total net return while improving the condition of the land.

Effects of soil type and fertilizer treatments on the chemical composition of certain forage and small grain crops, S. C. VANDECAVEYE. (Wash. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 107-119).—The author reviews a large number of papers, mostly from among those published in the last 10 yr. Of the papers dealing with the composition of pasture grass and hay, most attributed low nitrogen and phosphorus content to low soil fertility. Significant differences in composition of legume hays and cereal grains were most often referred to differences in soil texture. The results of 60 investigations indicated that applications of nitrogen fertilizers for pasture grass and hay effect increased percentages of nitrogen in the herbage, occasionally associated with reduced

percentages of phosphorus or calcium, or both, but in some instances with increased percentages of these constituents. Nine of the 31 studies of wheat revealed definite increases in content of nitrogen in the grain, whereas in the other 20 the composition of the grain was not affected unless late or large applications of nitrogen fertilizers were made or were affected irregularly, depending upon soil and other environmental factors. In barley, oats, and corn similar trends were indicated. With one exception, in 29 studies applications of phosphate fertilizers alone or with lime for pasture grass or hay effected an increased phosphorus content in the herbage, and, in the majority, also increased contents of nitrogen or calcium, or both. Similar trends were indicated by the results of the 14 studies pertaining to legumes, but not by the results of the 15 studies pertaining to wheat and barley, as in about 50 percent the phosphorus content in these cereal grains was not affected. Potash fertilizers applied alone or with phosphates for the production of pasture herbage, grass hay, and cereals, as reported by 29 investigators, had an irregular effect upon the mineral constituents of each of these crops. They caused significantly increased percentages of potassium in the herbage, hay, or grain in relatively few instances. The effect of complete fertilizers on the composition of crops varied considerably.

The value of liquid manure as a fertilizer for pasture, R. E. HODGSON, J. C. KNOTT, V. L. MILLER, H. K. MURER, U. S. ASHWORTH, F. B. WOLBERG, and K. BAUR. (Coop. U. S. D. A.). (*Washington Sta. Bul.* 412 (1942), pp. 28, fig. 1).—Liquid manure as used in this investigation consisted of both the solid and liquid excrement voided by cows during the time they were stanchioned in the barn for about 3 hr. twice a day. In order to avoid possible burning injury to the pastures, the total excrement was diluted approximately 10 times with water that was used to wash the milking barns. The excrement was collected and stored in a cement reservoir without a preservative until it was spread on the pasture. The average composition on a fresh basis of the liquid manure for a 4-yr. period was dry matter 2.08 percent, total nitrogen 0.125, ammonia nitrogen 0.076, calcium 0.037, phosphorus 0.014, and potassium 0.130 percent. The experimental plots were located on muck soil of high fertility. Rotational grazing was used, and the liquid manure was applied to each plot of the treated pasture immediately after each grazing. The period between application and grazing varied from 18 to 21 days, and there was no evidence that the palatability of the grass was affected. Liquid manure treatment gave an average yearly increase in yield of total digestible nutrients per acre of 8.3 percent over 5,767 lb. produced on the untreated pasture. Potassium content of the herbage from treated pastures averaged 75.6 percent higher than from untreated areas. The protein content was slightly higher on the treated area. Digestibility coefficients of herbage from the fertilized areas were consistently higher than for forage from the untreated pastures.

The problem of phosphate fertilizers, E. E. DETURK (*Illinois Sta. Bul.* 484 (1942), pp. 541-584, pl. 1, figs. 16).—This publication presents a comprehensive report on phosphate fertilization under Illinois conditions. The phosphorus-supplying power of the soil is reviewed in relation to the different forms of phosphorus found in the soil. The response to phosphorus as measured by yields of corn, oats, wheat, and hay was determined for various areas in the State.

The requirements for phosphorus of the various crops are discussed. Utilization of phosphorus by legumes is illustrated with sweetclover and is contrasted with that of small grains as illustrated by spring wheat. Phosphorus nutrition, requirements at various stages of growth, effect on plant development and maturity, seasonal variations in phosphorus supply of the soil, and deficiency symptoms are presented in detail for corn and wheat. The effect of liming on phosphorus

response is reviewed. The author concludes that both rock phosphate and superphosphate can play an important part in meeting the phosphorus requirement of Illinois soils for the production of maximum yields of major farm crops.

Comparative efficiency of organic phosphorus and of superphosphate in the nutrition of plants, B. R. BERTRAMSON and R. E. STEPHENSON. (Oreg. Expt. Sta.). (*Soil Sci.*, 53 (1942), No. 3, pp. 215-227, pl. 1).—The efficiency as compared with treble superphosphate of the various organic phosphorus fertilizers on acid soils in supplying, in pot tests, the immediate needs of the crop was in the following order: Treble superphosphate=calcium ethyl phosphate>nucleic acid>lecithin>phytin. The ease of decomposition of the organics was apparently in the same order, with the exception of phytin, which was probably precipitated in the soil. Experiments to determine which phosphorus fertilizer was the most efficient in supplying the plants with phosphorus over a long period showed the order of decreasing efficiency as follows: Treble superphosphate=calcium ethyl phosphate>nucleic acid>lecithin for the Aiken soil. The order for Sifton soil was calcium ethyl phosphate=lecithin>water only>nucleic acid=treble superphosphate. The total phosphorus content of the western Oregon soils according to groups was mature valley soils>recent stream-bottom soils>old residual hill soils. The percentage organic of the total phosphorus in these soils by groups was old residual hill soils>mature valley soils>recent stream-bottom soils. In general, the phosphorus fertility or supplying power of these soils was found to be in an order inverse to that of the organic phosphorus percentage of the total phosphorus.

Field test of phosphate fertilizers, C. F. NOLL and C. J. IRVIN (*Pennsylvania Sta. Bul.* 423 (1942), pp. [1]+14, fig. 1).—Supplementing Bulletin 315 (E. S. R., 74, p. 14), this publication covers a 20-yr. field test of superphosphate, rock phosphate, basic slag, and steamed bonemeal with a rotation of corn, wheat, oats, and mixed clover and timothy on Hagerstown silt loam soil. All phosphate carriers were applied with nitrogen and potash, and, in addition, all but bonemeal were used as supplements to manure. Without manure, rock phosphate supplying 144 lb. of phosphoric acid produced slightly better yields than superphosphate supplying 48 lb. of phosphoric acid. When used with manure on limed land, the yields were about the same from both. When 6 tons of manure was supplemented with superphosphate the returns were increased above the cost of the superphosphate by approximately \$1 per ton of manure.

Phosphorus fixation as affected by soil temperature, R. R. ROBINSON. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 4, pp. 301-306, fig. 1).—The effect of soil temperature on phosphorus fixation was determined for Dekalb silt loam by using Ladino clover as the indicator crop. Incubating the soil at optimum moisture content for 2 mo. with the temperature fluctuating between 15° and 45° C. resulted in poor plant growth when compared with incubation at a temperature of 3° or with no incubation treatment. Applications of large amounts of phosphorus on soils after incubation at high temperature produced good growth, thereby indicating that the poor growth on untreated soil was due to a decrease in available phosphorus.

The downward movement of lime and superphosphate in relation to permanent pasture fertilization, F. W. SCHALLER. (W. Va. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 162-166, figs. 8).—Determinations of pH and of available phosphate were made at the depths 0-1.5, 1.5-3, 3-5, and 5-7 in. Although most of the lime still remains near the surface, there was found a slow but continuous neutralization in the deeper layers. The movement of lime on plats over a 7- to 8-yr. period was less than that on the plats in operation for 14 yr. When superphosphate was used in addition to lime, the reduction of

acidity was less at all depths. Sodium nitrate caused an additional increase in pH at all depths. Phosphorus from superphosphate remained almost entirely in the surface 1.5 in. There was a slight penetration to 3 in., but almost none below that depth. Increased penetration of phosphorus resulted from an increase in the application of superphosphate and was further facilitated by a lighter soil texture.

Principal Colorado soils conserve lime for war because natural supply is high. D. S. ROMINE and R. GARDNER (*Colo. Farm Bul. [Colorado Sta.], 4 (1942), No. 2, pp. 21-22, fig. 1*).—Most Colorado soils contain sufficient to excessive supplies of lime, the principal agricultural soils being calcareous. Only relatively small areas of podzolic and rough mountainous soils show a lime requirement, and these lands are largely unsuitable for cultivation.

Liming Iowa soils. B. J. FIRKINS (*Iowa Sta. Bul. P45, n. ser. (1942), pp. 469-484, figs. 3*).—Iowa soils, once well supplied with lime, are gradually increasing in acidity because of losses from leaching, erosion, decomposition processes, removal by crops, and the sale of livestock products. Over 75 percent of the soils of the State are estimated to require lime for the efficient production of alfalfa, sweetclover, red clover, and other legumes. A practical discussion is presented on the benefits of lime from the plant and soil standpoint, and data are also given on the tolerance of various common plants to soil acidity. Methods of obtaining soil samples for determining the amount of lime to apply, sources of liming materials, factors governing the value of different liming materials, rates and time of application, and methods of distribution are given.

Adsorption of barium and hydroxyl ions by soils and minerals in relation to pH. A. MEHLICH. (N. C. Expt. Sta.). (*Soil Sci., 53 (1942), No. 2, pp. 115-124, figs. 3*).—Adsorption of barium by soils and several minerals reached a maximum at the point of neutralization of the exchangeable hydrogen. The reaction at which this occurred was about pH 6.0 for humic acid, 6.8 for peat, 7.9 for Eutaw, 8.2 for Norfolk, 8.1 for bentonite, 8.3 for chabasite, 8.7 for pyrophyllite, and pH 9.6 for kaolin. Above these pH values both barium and hydroxyl ions were adsorbed in increasing and essentially equivalent amounts. Maximum adsorption of barium by permutite, halloysite indianait, silica, and lignite was not measurable. Equivalent adsorption of barium and hydroxyl ions by these materials occurred above pH 5.2 for lignite, 7.6 for indianait, 7.9 for silica, and pH 8.7 for permutite. It is concluded that the method consisting of barium chloride buffered at pH 8.2 with triethanolamine (E. S. R., 86, p. 731) should yield maximum values for base-exchange capacity and exchangeable hydrogen for most agricultural soils.

The importance of sodium for plant nutrition.—III, The equilibrium of cations in the beet. J. J. LEHR (*Soil Sci., 53 (1942), No. 5, pp. 399-411, figs. 4*).—In experiments carried out in extension of work previously noted (E. S. R., 87, p. 29), fodder beets were grown on an artificial soil, the composition of the adsorption complex of which could be regulated arbitrarily. The artificial soil consisted of a carbon of high adsorptive capacity for cations, about 90 percent saturated with calcium, magnesium, potassium, or sodium ions, and mixed with sand to provide the desired total basic ion content and proportion of each ion. The equilibrium of ions in the beet, dominated largely by the ions potassium, sodium, and calcium, was correlated graphically with the production. The results indicate that foliage and root react differently to the proportion of ions in the soil. In the equilibrium of ions in the foliage sodium plays a very important part; in the equilibrium of ions in the root potassium is very important. Sodium can replace potassium to a large extent, however, in the beet root without detriment to good production and is, under all circumstances, an important fac-

tor in the equilibrium of ions. Good yields with no available sodium present could not be obtained. Calcium, on the contrary, when present in relatively large quantities, very soon has a detrimental effect on the production of both foliage and root. For practical beet culture sodium should, therefore, be preferred as the secondary ion in fertilizers. It has a potassium-conserving effect.

Effects of aluminum on copper toxicity, as revealed by solution-culture and spectrographic studies of citrus, G. F. LIEBIG, JR., A. P. VANSELOW, and H. D. CHAPMAN. (Calif. Citrus Expt. Sta.). (*Soil Sci.*, 53 (1942), No. 5, pp. 341-351, figs. 5).—An apparently stimulating effect of aluminum on citrus growth was shown to be due to the antagonistic effect of aluminum on copper. In the absence of aluminum, 0.1 p. p. m. copper was decidedly toxic to Valencia orange and lemon cuttings. The addition of 0.1 p. p. m. aluminum to cultures injured by such a concentration of copper was sufficient to offset this toxicity. The addition of 0.1 p. p. m. aluminum to purified nutrient solutions containing only a trace of copper and other micronutrients slightly depressed plant growth. The addition of from 2.5 to 5 p. p. m. aluminum to purified base nutrient solutions greatly stimulated root development but depressed top growth. Lower concentrations of aluminum, i. e., 0.1 and 0.5 p. p. m., did not produce this effect. Spectrographic analyses of various parts of lemon cuttings grown in solution cultures containing different concentrations of aluminum and copper indicated that the detoxifying influence of aluminum on copper is exerted in the roots. Aluminum did not prevent the absorption of copper by the roots but did, in some manner, prevent injury by this element. In the absence of aluminum, excessive copper caused a brownish appearance in citrus roots and short, swollen laterals which give the roots a dwarfed, knotty, and unhealthy appearance. Subsequent top growth commonly exhibited iron chlorosis.

Field studies on methods for determining availability of selenium to plants, O. E. OLSON, D. F. JORNLIN, and A. L. MOXON. (S. Dak. Expt. Sta.). (*Soil Sci.*, 53 (1942), No. 5, pp. 365-368).—In naturally seleniferous soils no correlation between the selenium content of *Agropyron smithi* and the total, water-soluble, or base-soluble selenium content of the surface foot of the soil in which it grew could be found. Soils in which the leaching of selenium was apparently the greatest seemed to produce plants of the highest selenium contents, and it appeared that much selenium is absorbed from the subsurface soils. The analysis of the plants growing in a soil seemed to be the most practicable method of determining the "available" selenium in the soil.

Inspection of fertilizers, E. J. DESZYCK and R. W. GILBERT (*Rhode Island Sta. Ann. Fert. Cir.*, 1942, pp. 19).—In addition to the presentation for the 1941 season of the inspection analysis data, this circular points out that the use of inert fillers in fertilizer mixtures involves transportation of filler which "may be equivalent to a 100-mile movement of 31,000 freight cars. Its handling may approximate the full working time of 1,000 men." The consumer is held guilty of a large share of the blame for this waste in maintaining a demand for mixtures containing unnecessary diluents.

AGRICULTURAL BOTANY

Drug plants native to Great Britain, W. O. JAMES (*Nature [London]*, 148 (1941), No. 3747, pp. 217-218).—"Apart from herbalist simples, there are some half-dozen or so plants of Europe and the British Isles which yield drugs of first-class medical importance." These are discussed as to phases related to war shortages, including collection of wild plants, cultivation, and processing.

The identification and characterization of bacteriophages with the electron microscope, S. E. LURIA and T. F. ANDERSON (*Natl. Acad. Sci. Proc.*, 28

(1942), No. 4, pp. 127-130, pls. 2).—The morphology and particle diameter are presented and illustrated for two bacteriophages active against *Escherichia coli* and one against a staphylococcus. The extreme interest is pointed out of the finding of such constant and relatively elaborate structural differentiation in objects of supposedly macromolecular nature, and the significance of the results is briefly discussed.

Use of complete fertilizers in cultivation of microorganisms, V. L. LOOSANOFF and J. B. ENGLE (*Science*, 95 (1942), No. 2471, pp. 487-488).—Sometimes experimental work requires the use of very large amounts of a culture containing micro-organisms, as in the growing of phytoplankton for studies on the physiology of feeding of oysters. Of a large number of commercial fertilizer mixtures tried for this purpose, several gave excellent results. In outdoor tanks of several thousand gallons capacity, *Chlorella*, *Nitzschia*, *Proocentrum*, and many other micro-organisms (including chlorophyll-bearing and colorless flagellates) grew exceptionally well, and ciliates produced good cultures. It is believed that this method may prove especially useful at this time when the ordinary media are difficult to obtain.

Secondary spores in the mycelium of the cultivated mushroom, *Psalliota campestris* Fr., A. M. KLIGMAN. (Pa. State Col. et al.). (*Amer. Jour. Bot.*, 29 (1942), No. 4, pp. 304-308, figs. 9).—Chlamydosporelike cells are described for varieties and races of *P. campestris*.

The Polyporaceae of Pennsylvania.—III, The genus *Poria*, L. O. OVERHOLTS (*Pennsylvania Sta. Bul.* 418 (1942), pp. 64).—Continuing this taxonomic series (E. S. R., 74, p. 48), 60 species of *Poria* (8 new) are here considered. Included are an index to the species, a tabulated arrangement under the 3 sections of the genus, and a key to the species. This study is preparatory to a monographic treatment of the species of the genus in the United States and Canada.

Vitamin deficiencies of the filamentous fungi, W. J. ROBBINS and V. KAVANAGH (*Bot. Rev.*, 8 (1942), No. 7, pp. 411-471).—It is now well recognized that the growth of many fungi is determined by the presence or absence in the medium of vitamins or their components or derivatives. The subject is of fundamental significance not only to the culturing of specific fungi but also to our knowledge of vitamins and to a clear understanding of the basic factors concerned in the development of all organisms. Because of the ease and convenience with which they may be cultivated, fungi may afford information on vitamins more quickly than can be obtained with experimental animals. In this analytical review the authors summarize the literature (147 references) on the relations of vitamins to the growth of specific fungi, including those which have been reported to grow poorly or not at all in solutions limited to minerals, sugar, and a nitrogen source. The name of each fungus (approximately 400 entries, alphabetically arranged) is given with the general composition of the basal medium used and the effect on development of the fungus of the addition of natural extracts or pure vitamins.

The effect of vitamins on ten strains of *Saccharomyces cerevisiae*, L. H. LEONIAN and V. G. LILLY. (W. Va. Expt. Sta.). (*Amer. Jour. Bot.*, 29 (1942), No. 6, pp. 459-464).—Singly and in all combinations, 5 growth substances were tested on 10 strains of this yeast. After 72 hours' incubation at 25° C., 4 strains proved dependent on inositol and only 1 on thiamin, all 10 were greatly restricted in growth with pantothenic acid omitted, and no growth occurred when biotin alone was left out. None of the strains were affected by lack of pyridoxin, but when thiamin and pyridoxin or thiamin and inositol were omitted some were reduced in growth, though they were unaffected when these substances were left

out one at a time. Some strains were unable to produce optimum growth when only two growth factors were present, some required three, and others four. With the incubation period reduced to 48 hr., a number of strains became dependent on one or more growth factors which did not appear necessary with the 72-hr. period. Often the amount of inoculum controlled growth, but in other cases it apparently did not.

Hypoxanthine, a growth substance for Phycomyces, W. J. ROBBINS and F. KAVANAGH (*Natl. Acad. Sci. Proc.*, 28 (1942), No. 3, pp. 65-69, fig. 1).—The unidentified growth substance previously referred to as factor Z_4 (E. S. R., 87, p. 194) is here identified as hypoxanthine and the study discussed in detail.

Effect of the vapor of the methyl ester of α -naphthaleneacetic acid on the sprouting and the sugar content of potato tubers, F. E. DENNY, J. D. GUTHRIE, and N. C. THORNTON (*Contrib. Boyce Thompson Inst.*, 12 (1942), No. 4, pp. 253-268, fig. 1).—When this ester was incorporated into filter papers distributed among potato tubers in glazed earthenware containers, sprouting was inhibited. With as much as 400 mg. per 1 kg. of tubers, sprouting was prevented for at least 1 yr. from harvest, but with 100 mg. some sprout development occurred after 6-8 mo. Sprouting was definitely retarded by 30 mg., and the lower limit under test conditions was about 10 mg. The impregnated filter papers, after storage with tubers for several months in closed but not entirely sealed containers, were still effective when used on a second lot. Applied for 10 days to a month, a definite retardation of sprout development was obtained, but the inhibition was incomplete and the result after 3-8 mo. was much less marked than that under continuous treatment. There was neither shrinkage nor sprouting of tubers stored under this ester treatment at 10° C. Sprouting was inhibited satisfactorily at 15° for at least 8 mo. and at 18° for 3-6 mo., but in each case there was some shrinkage. The treatment appeared to have no definite effects on the sugar content of the juice of the tubers, but it permitted them to be stored at temperatures sufficiently high to maintain low values for reducing sugar content and so to furnish potato chips of satisfactory color. However, because of lack of information as to the toxicity of the chemical, no recommendations are as yet given for use of the method with tubers destined to be used as food.

Inactivation of the browning system in frozen-stored fruit tissue, F. E. DENNY (*Contrib. Boyce Thompson Inst.*, 12 (1942), No. 4, pp. 309-320, figs. 3).—After peeling, coring, or pitting, tissues of peach, pear, and apple fruits dipped in dilute solutions of thiourea and then frozen in a cold room at -6° to -10° C. could be stored for many months or even more than a year without browning. Furthermore, tissue so treated did not turn brown when thawed and exposed to the air, or even after it had been thoroughly leached with water for 20-24 hr. to remove the thiourea. Only a short storage period was needed to inactivate the browning system in the treated tissue. A method was also developed for obtaining and holding apple tissue in the frozen state without browning or thiourea treatment, but such tissue browned on thawing and exposure to the air. Thus it is clear that the conditions during the freezing period were not such as to cause inactivation of the browning system in the absence of thiourea, and that thiourea by its presence caused a loss of the capacity of the tissue to turn brown.

Additional studies regarding the cation absorption mechanism of plants in soil, R. OVERSTREET, T. C. BROYER, T. L. ISAACS, and C. C. DELWICHE. (Univ. Calif.). (*Amer. Jour. Bot.*, 29 (1942), No. 3, pp. 227-231, figs. 2).—With flowing KCl culture solutions containing radioactive K, a determination of the influence of concentration on the rate of K absorption by barley roots was made for very short intervals, and an approximate value for the maximum absorption rate per unit area of root surface was calculated for the more active regions of the

tissue. A determination was also made of the magnitude of the CO_2 liberation by absorbing roots in K-bentonite suspensions as a function of time. The relationship between organic acid synthesis by roots and ion absorption from K-bentonite suspensions and K salt solutions was investigated, and it is concluded that CO_2 , if involved at all, must play an intermediate role in cation absorption from clay suspensions. Proposed mechanisms for cation absorption by roots in soil and clay suspensions are discussed. See also a previous note by Hoagland and Broyer (E. S. R., 76, p. 457).

Effects of Ca and other divalent ions on the accumulation of monovalent ions by barley root cells, F. G. VIETS, JR. (Univ. Calif.). (*Science*, 95 (1942), No. 2471, pp. 486-487).—The results of tests reported suggest the possibility that Ca and kindred cations can increase the permeability of the plasma membrane to K and Br during concurrent salt accumulation.

The relation of zinc to seed production, H. S. REED. (Calif. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 11, pp. 635-644, figs. 2).—Though the amounts necessary were small, Zn proved essential for both vegetative and reproductive processes in peas, beans, and milo. Peas and beans furnished with suboptimum quantities of Zn may make appreciable vegetative development without forming seeds, and if pods are formed they are usually seedless. A definite threshold concentration of Zn necessary for seed production was shown by plants grown in nutrient solutions. As to viability, small peas from plants receiving concentrations close to the threshold values were as good as larger seeds from superior plants. The amounts of Zn, although suboptimum, may nevertheless be responsible for the formation of sufficient stored auxin to insure development of the embryonic plants. There are 15 references.

Reserve foods in the roots of whiteweed (*Cardaria draba* var. *repens*), C. G. BARR. (Colo. Expt. Sta. coop. U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 12, pp. 725-740, figs. 8).—Data showing the seasonal trend of carbohydrates in both noncultivated and cultivated plats are presented. Samples collected at 2-week intervals from April 25 to October 29 from noncultivated plats indicated a maximum accumulation of carbohydrates about August 1, and the lowest content was found early when sampling was started. The total sugar content was higher in roots from the second foot of soil than in those from the first-foot level until about mid-September. Root reserves were present chiefly as starch. The starch content of undisturbed plants reached a maximum of over 21 percent fresh weight, but the total sugar content never exceeded 7.44 percent and reducing sugars remained uniformly low, reaching a maximum of 1.41 percent. Clean cultivation held the starch content to about 4.5 percent and total sugars to less than 3.5 percent. Both soluble and colloidal N decreased during vegetative growth and showed a slight but apparent increase after flowering. Samples collected at 4-day intervals during 24 days after a single cultivation showed no material change in carbohydrate reserves until about 14-16 days after cultivation, after which there was an appreciable accumulation. Sodium chlorate treatment for controlling whiteweed was not increased in effectiveness by an early season cultivation. Biweekly cultivations proved as effective as weekly cultivations in reducing the root reserves and in controlling the weed.

Presence of anti-hemorrhagic material in roots of European bindweed (*Convolvulus arvensis* L.), A. L. BAKKE and N. D. RENDER. (Iowa Expt. Sta. coop. U. S. D. A. et al.). (*Amer. Jour. Bot.*, 29 (1942), No. 5, pp. 353-354).—A substance (or substances) was found which causes clotting in human blood.

Physiology of rotenone crops (*Puerto Rico Sta. Rpt.* 1940, pp. 43-44, 45, 46, figs. 2).—Data are presented on factors influencing elaboration of rotenoids, the effects of weather cycles on the tissue patterns of *Derris* grown in Puerto

Rico, root diameter as an unreliable indicator of rotenoid content, and *Derris* from the Far East showing tissue patterns similar to those of locally grown roots.

The process of amino acid formation from sugars in *Aspergillus niger*, R. A. STEINBERG. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 11, pp. 615-633).—"Carbon utilization factors (grams of yield per gram of carbon supply) for about 120 compounds, obtained with *A. niger* Van Tiegh. grown for 4 days at 35° C., were as follows: D-glucose, 1.43; D-mannose, 1.46; D-fructose, 1.88; L-sorbose, 1.26; and D-xylose, 1.09. Other compounds were poor sources of carbon supply. Enolization was not a factor in sugar utilization. All pentoses and hexoses having an L-3-carbon atom and a D-4-carbon atom were assimilable, except the epimers of D-xylose and probably L-sorbose. Preliminary oxidation to α -keto acid derivatives and decarboxylation appeared necessary for assimilation of hexoses. The hypothesis was proposed that the aldehyde derivative of L- α , β -dihydroxy *n*-valeric acid served as precursor for amino acid formation. D-4-carbon of the monoses became L- α -amino carbon in the amino acids, and L-3-carbon remained unchanged to become *d*- β -hydroxy in *d*(-)-threonine, and possibly in hydroxyglutamic acid and hydroxyproline also. The primary amino acids formed were probably proline, glutamic acid, and ornithine—all α , δ -derivatives of *n*-valeric acid—since mixtures of these attained a carbon utilization factor of 0.83 as compared to 1.17 with sucrose. Evidence was obtained that the carbon utilization factor for amino acid mixtures was increased by substitution of the corresponding hydroxy acids. Growth requirements for trace elements with assimilable sugars showed little difference, except that cultures on D-xylose from which iron had apparently been removed by treatment with calcium carbonate gave exceptionally high yields. Trace-element requirements with monoses were quite similar to those with sucrose." There are 17 references.

Reversions in morphology of nitrite-induced "mutants" of *Aspergillus niger* grown on amino acids, R. A. STEINBERG and C. THOM. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 11, pp. 645-652).—Morphological reversion to the original strain occurred in a nitrite-induced injury-mutant of *Aspergillus niger* when grown on lysine, cystine, β -phenyl- β -alanine, threonine, and valine; or in admixture with lysine, on arginine, aspartic acid, histidine, tyrosine, or valine. A mixture of nicotinic acid, lysine, and valine gave best results. A nitrite-induced injury-variant of *A. amstelodami* gave complete morphological reversion to the original strain only with a mixture of lysine and threonine. Assimilability of amino acids did not appear to be a major factor in these responses. Comparison of the capacities for amino acid utilization between the standard strain and each of two variants of *A. niger* disclosed alterations proportional to the extent of morphological change. These changed assimilation capacities did not destroy the general nature of the responses characteristic of the original strain, though individual amino acids were affected. The variant having the greater morphological alterations exhibited much less capacity for assimilating the fully plastic acids (aspartic acid, glutamic acid, and proline) and increased capacity for utilizing the aplastic acids (cystine, histidine, lysine, norleucine, and tyrosine). Utilization of hydroxyproline had become particularly poor in the almost sterile or more atypical variant. Enzyme suppression with nitrite disturbed the cell maturation as in abnormal cells produced in animals by carcinogenic compounds.

The growth and metabolism of oat seedlings after seed exposure to oxygen, H. G. ALBAUM, J. DONNELLY, and S. KORKEKES (*Amer. Jour. Bot.*, 29 (1942), No. 5, pp. 388-395, figs. 8).—When oats grains were oxygenated during the soaking period, subsequent growth was almost completely inhibited as compared to aerated

controls. Assays 80 hr. after oxygenation indicated little or no change in cytochrome activity, but lowered catalase and endogenous dehydrogenase activities. During normal development, N moves from endosperm to embryo and the increase in embryo N follows the course of growth. In plants grown from oxygenated grains, N increase in the embryo occurs more slowly for a time and then stops, this behavior being correlated with the same type of growth pattern. Oxygenation at first slows down catalase activity and later causes its destruction. Development of catalase and dehydrogenase activities in intact embryos appears correlated with the movement of N from the endosperm to the embryo in both normal and oxygenated grains. Failure of N to move from endosperm to embryo in oxygenated plants is apparently not due to the mechanical removal of CO₂ by pure O₂, since N gas produces no comparable growth inhibition. On data presented, it is suggested that O₂ may interfere with proteolytic breakdown in the endosperm and, consequently, prevent N transport, development of enzyme activity, and finally growth.

Effects of mercury vapor upon seed germination, N. E. GRAY and H. J. FULLER. (Univ. Ill.). (*Amer. Jour. Bot.*, 29 (1942), No. 6, pp. 456-459, figs. 3).—Pea, corn, bean, radish, sunflower, and cucumber seed stored for 6 mo. in nearly airtight containers with Hg vapor suffered no ill effects, showing a slightly delayed germination but no decrease in germination percentage or early seedling growth. Pea, corn, and bean seedlings grown in the presence of Hg vapor in the surrounding air and in the substratum grew more poorly than those with Hg in the air only, and under both these conditions more slowly than in the total absence of Hg. In addition to their stunted growth, they also exhibited developmental failure, yellowing, and falling of the leaves.

Dormancy in seeds of *Convallaria majalis* L. and *Smilacina racemosa* (L.) Desf., L. V. BARTON and E. M. SCHROEDER (*Contrib. Boyce Thompson Inst.*, 12 (1942), No. 4, pp. 277-300, figs. 8).—Seed of these two plants were found to show a new type of epicotyl dormancy. Low temperature pretreatment was required for forcing shoot growth after the root had started to grow, but was effective only if given after the shoot had broken through the cotyledonary sheath. Embryo development to the proper stage for low temperature exposure was more rapid at greenhouse than at lower temperatures. The low temperature pretreatment increased root production from seed of *Convallaria* and was essential for root formation in *Smilacina* in soil plantings in the greenhouse. The best treatments for producing green leaves above soil in these plants are detailed. In commercial practice, seed should be cleaned and planted soon after harvest in the fall, and seedlings will appear above ground the second spring after planting. Some green leaves of *Convallaria* may be produced after one winter provided the planting is early enough to afford several weeks of warm weather, during which a small percentage of roots may grow. Under controlled temperatures, good seedling stands may be had within 9 mo. after harvest for *Convallaria* and 14 mo. for *Smilacina*.

Germination studies of seeds of *Symphoricarpos orbiculatus*, F. FLEMION and E. PARKER (*Contrib. Boyce Thompson Inst.*, 12 (1942), No. 4, pp. 301-307, fig. 1).—To induce germination of the seed it was found necessary to disintegrate the seed coat as well as to afterripen the embryo—accomplished by 3-4 mo. in moist peat moss at 25° C. followed by about 3 mo. at 10°. For producing seedlings on a large scale it is recommended that the seed be planted in flats of soil in the spring and held outdoors in a coldframe under a board cover during the subsequent winter, germination taking place the following spring. By combining the H₂SO₄ treatment described with a short period at high temperatures, seed-

lings can be obtained the first spring providing the seed are afterripened in a cellar maintained at about 10°.

A method for the culture of seedlings and small plants in sunlight under controlled temperature conditions, J. A. PINCKARD and L. S. BOZOVASKY. (Va. and Miss. Expt. Stas.). (*Phytopathology*, 32 (1942), No. 6, pp. 467-476, figs. 6).—The authors describe refrigerated plant-culture chambers for use in full sunlight at 65°-105° F. and in darkness down to 25°, ordinary commercial refrigeration equipment, apparatus, and materials being employed. The accuracy of control obtainable with the commercial equipment used was within 2°-3° of that desired. The principle of design adopted is described as the movement of low-velocity air at a stated temperature across surfaces exposed to light radiation.

The physiology and nutrition of plants under artificial light supplementing daylight (*Indiana Sta. Rpt.* 1941, pp. 83-85, fig. 1).—A brief summary is presented of four types of investigation, by R. B. Withrow, J. P. Biebel, and T. M. Eastwood, on the physiology and nutrition of plants under artificial light supplementing daylight and on the major results obtained.

Carbon dioxide evolution during the induction period of photosynthesis, J. FRANCK (*Amer. Jour. Bot.*, 29 (1942), No. 4, pp. 314-317).—Emerson and Lewis (*E. S. R.*, 87, p. 42) observed that with algae under special conditions a CO₂ evolution occurs at the beginning of an illumination period and were inclined to suppose that this process has no direct connection with photosynthesis. This paper purposes to show that what they observed is a special case of the normal induction period, and its interpretation is closely related to that given by Franck, C. S. French, and T. T. Puck² for other induction phenomena. From this standpoint CO₂ evolution is explained by back reactions, and thus lends support to the principle advanced by Franck and K. F. Herzfeld³ that such reactions influence the kinetics of photosynthesis whenever catalytic limitations occur.

Photosynthesis and absorption in blue radiation, G. R. BURNS. (Vt. Expt. Sta. et al.). (*Amer. Jour. Bot.*, 29 (1942), No. 5, pp. 381-387, figs. 4).—The relative photosynthetic efficiencies, based on incident quanta, of white pine, Norway spruce, and Marquis wheat were determined in monochromatic radiation at several wavelengths, and some rough measurements of the absorption and the primary absorption were made at the same wavelengths. The relative efficiency of both pine and spruce at 5,461 a. u. and 5,780 a. u. was the same as in previous work (*E. S. R.*, 79, p. 458), and the efficiency at 4,358 a. u. was about the same as 5,461 a. u. The efficiency of wheat was highest in the blue, lower in the yellow, and the same or still lower in the green. The actual values depended on the pigment concentration or leaf number in a given volume. At 3,650 a. u. wheat showed large amounts of photosynthesis and pine none. The efficiency of wheat in the blue, green, and yellow radiation was roughly the same as its absorption and the same as its primary absorption. The efficiency of pine in the green and yellow radiation was much closer to the primary absorption than to the actual absorption, and in the blue radiation the efficiency was much lower than absorption. Pine apparently has absorption of radiation by inactive pigments in the blue and probably in the green and yellow.

A symposium on the structure of protoplasm: A monograph of the American Society of Plant Physiologists, edited by W. SIEFELT (*Ames: Iowa State Col. Press*, 1942, pp. VII+283, figs. [81]).—After the foreword, by W. E. Loomis, and the introduction, by the editor, the following papers are included: *Microscopic Structure of the Cell Wall*, by C. W. Hock (pp. 11-21); *Proteins and Protoplasmic Structure*, by L. S. Moyer (pp. 23-40) (Univ. Minn.); *Molec-*

² *Jour. Phys. Chem.*, 45 (1941), No. 8, pp. 1268-1300, figs. 25.

³ *Jour. Phys. Chem.*, 45 (1941), No. 6, pp. 978-1025, fig. 1.

ular Structure in Protoplasm, by C. L. Sponsler and J. D. Bath (pp. 41-79) (Univ. Calif.); Some Mechanical Properties of Solis and Gels and Their Relation to Protoplasmic Structure, by H. Freundlich (pp. 82-98) (Univ. Minn.); Structural Differentiation of Cytoplasm, by G. W. Scarth (pp. 99-107); Structural Differentiation of the Nucleus, by C. L. Huskins (pp. 109-126); Protoplasmic Streaming in Relation to Gel Structure in the Cytoplasm, by D. A. Marsland (pp. 127-161); The Relation of the Viscosity Changes of Protoplasm to Ameboid Locomotion and Cell Division, by W. H. Lewis (pp. 163-197); Physical Aspects of Protoplasmic Streaming, by N. Kamiya (pp. 199-244); Some Physical Properties of Protoplasm and Their Bearing on Structure, by W. Selfriz (pp. 245-284); and Protein and Protoplasmic Structure, by K. H. Meyer (pp. 287-270). Bibliographies follow each paper. The symposium ends with a letter from W. T. Astbury (with a comment by the editor) and a subject and author index.

Heterocaryosis and variability, H. N. HANSEN. (Univ. Calif.). (*Phytopathology*, 32 (1942), No. 7, pp. 639-640).—With the intent to clarify certain concepts of fungus variability, it is pointed out that heterocaryosis describes the condition of a cell or thallus containing genetically different nuclei. This phenomenon is initiated either by mutation in a plurinucleate cell or thallus or by anastomoses between cells having genetically unlike nuclei. Heterocaryosis is said to be the result, not the cause, of variation (mutation).

The cytonuclear ratio, V. V. TROMBETTA (*Bot. Rev.*, 8 (1942), No. 5, pp. 317-336).—This review (54 references) deals chiefly with the question of regularity of cell-nuclear size relationship in the growth and maturity of plants. Physiological inferences are "mentioned but not treated exhaustively."

Shrinkage and cell wall structure of cotton fibers, E. E. BERKLEY. (U. S. D. A.). (*Amer. Jour. Bot.*, 29 (1942), No. 5, pp. 416-423, figs. 6).—Longitudinal shrinkage of cotton fibers dried from the "green" to the air-dry and oven-dry conditions was measured on seven varieties representing *Gossypium hirsutum* and *G. barbadense*, collected at frequent intervals beginning 10 days after the flowers opened. At 10 days the air-dry shrinkage was about 35-40 percent of the green moist length of fiber, between this and initiation of secondary thickening the shrinkage gradually decreased, then more rapidly for 2-5 days further, and after this it changed very little. There was an increase of about 4 percent in shrinkage when the waxes were removed. Details of various treatments given to the bundles of fibers are noted, but in no instance, after once dried to the air-dry or oven-dry state, did they swell to their original green length. The results presented are believed to confirm the microscopic and X-ray studies which indicate that the crystalline cellulose of the primary wall lies transversely to the long axis of the fiber or in a low spiral around it, and to indicate that only a small proportion of the primary wall is crystalline cellulose. There are 34 references.

An analysis of the comparative rates of cell division in various parts of the developing cucurbit ovary, E. W. SINNOTT (*Amer. Jour. Bot.*, 29 (1942), No. 4, pp. 317-323, fig. 1).—In 11 cucurbit lines of 3 genera, the increase in cell number between an ovary diameter of 2 mm. and one of 10 mm. was determined for the placental region and inner and outer wall and for the epidermis. Cell division was still taking place in all these regions. Between these two ovary sizes epidermal cell volume remained essentially constant, but in the other regions cell volume increased and at a higher rate in the inner than in the outer ones. Regional volume also increased faster in the inner than in the outer part, and there was a close correlation between rate of increase in cell volume and in regional volume. Cell number thus increases at essentially the

same rate in all four regions, so that rate of cell division is independent of cell size or position. The increase in cell number in all regions tended to be the same as the increase in ovary surface, and the physiological implications are discussed. The greater increase in volume of inner cells as compared to epidermis is a necessary result of the fact that the ovary volume increases faster than its surface but that the rate of cell division is constant. Possible reasons for the gradient in cell size from surface to center are suggested. The relation of the results of this study to various problems of growth and differentiation are discussed.

A method of growing plants in water vapor to facilitate examination of roots, W. CARTER. (Univ. Hawaii). (*Phytopathology*, 32 (1942), No. 7, pp. 623-625, figs. 3).—The plants are set in the perforated top of a simply constructed box in which is fixed an atomizing device, or in an air-conditioning apparatus. These devices permit a very fine jet of water or nutrient solution to impinge on a metal plate, which results in a steady drift of finely divided vapor. Domestic water pressure proved adequate.

The occurrence and types of vessels in the various organs of the plant in the Monocotyledoneae, V. I. CHEADLE. (R. I. State Col.). (*Amer. Jour. Bot.*, 29 (1942), No. 6, pp. 441-450, figs. 10).—"The present paper is a report on the occurrence and types of true vessels in the various organs from a wide representation of the Monocots." There are 30 references.

The development of vascular connections in the leaf-sheath of sugarcane, C. F. MORELAND and L. H. FLINT. (La. State Univ.). (*Amer. Jour. Bot.*, 29 (1942), No. 5, pp. 361-362, figs. 6).—Radial and tangential cross-veinlets connecting vertical vascular bundles were observed within the leaf sheaths of sugarcane, being distributed at approximately regular intervals in the vertical plane and occasionally branched. These cross-veinlets originated within a single or branched horizontal line of parenchyma cells and for the most part remained restricted within the old boundaries of these cells. Temporary meristem was continuous with similar meristem within the vertical bundles, and differentiation extended to the elaboration of xylem and phloem. The development of a secondary meristem and the extension of such cambium from one vertical bundle to another indicated activities within monocotyledons similar to some of those more commonly associated with dicotyledons.

A comparative analysis of the vegetative characteristics of some variants of *Saccharum spontaneum*, E. ARTSCHWAGER (*U. S. Dept. Agr., Tech. Bul.* 811 (1942), pp. 55, figs. 26).—During recent years the increasing use of wild forms of *Saccharum* in sugarcane breeding has elicited an extensive interest in *S. spontaneum*, resulting in the assemblage at certain breeding stations of numerous clones from various parts of the indigenous range. The number has now become so large that a comparative analysis of the characteristics of the more divergent clones has become an acute need, and the present study was undertaken to obtain a better conception of the morphological relationships of certain elements of this complex group. In devising a system of identification for the various clones imported from Asia and the East Indies and grown at the United States Sugar Plant Field Station at Canal Point, Fla., different gross and minute morphological characters as well as certain microscopic features of the epidermis were employed. The presence of certain hair groups on leaf sheath, sheath base, and blade joint proved very useful in the major subdivisions, whereas qualitative differences had to be relied on for separating individual clones. The key given is intended to cover only the 23 clones here described. There are 11 references.

A quantitative morphological analysis of large and small leaves of alfalfa, with special reference to internal surface, F. M. TURBELL. (Calif. Citrus

Expt. Sta.). (*Amer. Jour. Bot.*, 29 (1942), No. 5, pp. 400-415, figs. 23).—This study on the morphology of alfalfa leaves, details of which are given, was an outgrowth of interest in the responses of the leaves to SO_2 gas. From the evidence obtained it is concluded that large internal-external surface ratios, large volume of intercellular space, large stomatal pores, and large vein islet areas are positively correlated with large leaf size and the reported greater SO_2 injury in the larger leaves.

Development and relative growth in ovaries of *Iris fulva* and *I. hexagona* var. *giganticaerulea*, H. P. RILEY (*Amer. Jour. Bot.*, 29 (1942), No. 4, pp. 323-331, figs. 21).—Various radil of cross sections of developing capsules of these two irises were compared, and from the results as presented and discussed it is concluded that differences in the relative growth rates of the radil are due chiefly to differences in the relative growth rates of the ovary walls at those radil.

GENETICS

Genetics of pseudo-self-compatibility and its relation to cross-incompatibility in *Trifolium repens*, S. S. ARWOOD. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 12, pp. 699-709).—The original female parent of the white clover plants used set many selfed seeds when entire heads were manipulated but failed to set seed when 10 flowers per head were self-pollinated by hand in the greenhouse. The male parent was self-incompatible. The pseudo-self-compatibility of the female, transmitted to F_1 , F_2 , and backcross-generation plants, appeared to be conditioned by several genes additive in effect and heterozygous in the parents. Four intrasterile, interfertile groups of plants were found among the F_1 plants. Compatible F_1 intercrosses averaged 40.8 seeds per 10 flowers, the incompatibles 0.18. These cross-incompatibilities are explained by the diploid personate theory of oppositional allelomorphs if it is assumed that the parents differed in all 4 factors carried. In a further test by backcrossing 38 selected F_1 plants to the 2 parental and 4 F_1 groups, only expected groups were obtained. A certain genotype was assigned to each group, and the oppositional-factor hypothesis was confirmed for these pseudo-self-compatible plants. Of 41 plants from incompatible crosses or selfs, 12 were homozygous, 18 heterozygous, and 11 contaminants. Among the 12 were the 4 possible homozygous genotypes. One S gene from the pseudo-self-compatible parent was identical with the S_1 previously isolated from a self-incompatible plant. When the original female parent was backcrossed with F_1 , F_2 , and homozygous plants certain combinations failed where they were expected to be compatible, and the reverse held with others. These results were explicable by assuming that this original parent changed from $S_1 S_1$ to $S_2 S_2$ after the original cross as a result of either mutation or contamination in the field. Since plants of both relatively high and low pseudo-self-compatibility were in each of the 6 groups, little relationship evidently exists between the S factors and those conditioning ability to set some selfed seed after manipulation.

Inheritance of cross- and self-sterility and self-fertility in *Beta vulgaris*, F. V. OWEN. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 12, pp. 679-698, figs. 6).—Degree of self-sterility in beets was found to be determined by both environmental and heritable influences. Under greenhouse conditions, end-season self-fertility was pronounced with certain self-sterile plants. Intermediate types with a partly self-fertile condition, which was clearly heritable, were observed. Cross-sterility, common in the curly top-resistant line 12c, was often nonreciprocal in behavior, and an explanation based on a duplicate series of oppositional factors explained most of the results. A highly self-fertile condition was produced by a single Mendelian factor designated S^f . Self-sterile

plants were designated $S^a S^b$. The heterozygous S'/S^a plants bred true for self-fertility, presumably with the production of only S'/S' and S'/S^a offspring. In one instance reported, self-fertility arose suddenly in a self-sterile line, presumably by mutation.

Genetic stability of tomato diploids and tetraploids derived from haploid. E. W. LINDSTROM. (Iowa Expt. Sta.). (*Iowa Acad. Sci. Proc.*, 47 (1940), p. 75).—An absolutely homozygous tomato was obtained by doubling the chromosomes of a haploid form asexually. Ten generations of severe selection in an attempt to alter this pure line resulted in very minor changes. The original haploid now carried for 12 yr. asexually proved remarkably constant. Seven generations of selection for fertility in the homozygous tetraploid, derived asexually from the above diploid, have also had no effect in a population of over 400 plants. This pure autotetraploid is highly sterile, being less than 1 percent as fertile as its parental diploid.

The F_1 combining ability of certain tomato varieties. R. E. LARSON. (Minn. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 313–314).—First-generation hybrids between relatively new varieties and unnamed strains of tomatoes were grown in a randomized block test to determine their capacity to develop desirable characters such as early maturity, yield, size of fruit, etc. Earliness and size and shape of fruit were inherited intermediately. It was evident that the factors for increased yield are dominant in most F_1 hybrids, but the complementary effect of genes for yield in several crosses produced an F_1 that is higher in yield than either parent. None of the parents of the highest yielding crosses was high in productivity, suggesting that the performance of the parents cannot be used as a prediction for yield and that the testing of various combinations is the better approach.

Infertility in hybrid walnuts. J. W. MCKAY. (U. S. D. A.). (*North. Nut Growers Assoc. Proc.*, 32 (1941), pp. 84–86).—Studies of seedlings of two Maryland walnuts, Galley and O'Conner, presumptive hybrids between *Juglans regia* and *J. nigra* and characterized by extremely light bearing, showed wide variation in foliage characters and growth rates. Some of the seedlings resembled *J. regia*, and others were more like *J. nigra*. A few were intermediate. Cytological studies revealed a very irregular pairing of the chromosomes in the pollen and egg cells of the hybrid trees, indicating hybridity between rather widely separated species. Apparently the Galley and O'Conner walnuts are infertile chiefly because of the formation of aberrant pollen and egg cells in the staminate and pistillate blooms.

The inheritance of induced mutations in Neurospora tetrasperma. W. S. MALLOCH (*Mycologia*, 34 (1942), No. 3, pp. 325–347).—Eight character combinations derived from one X-rayed ascospore of this fungus were analyzed, and a genetic study of these characters indicated that the different types are governed by three pairs of factors, *Aa*, *Ww*, and *Pp*. *Aa* governs sex expression, *A* being associated with pale and *a* with salmon-orange conidiospore color. *W* and *w* are factors affecting the form of hyphal growth, *W* being a dominant for normal, and *w* a recessive for dwarf type of growth. *W* is strongly linked to *a*, and *w* to *A*. *Pp* governs perithecial development, *P* being associated with normal perithecial and ascospore production, and *p* with their reduced development. Different genetic combinations were produced by various interactions among these factors. The X-ray-induced alterations here studied behaved like gene mutations. Phenomena influencing the segregation of genetic factors in this fungus are presented. It is believed that *N. tetrasperma* should prove a favorable organism for investigating the nature of chemical substances produced by different genes, since both unisexual and bisexual types are available. As evi-

denced by the increased vigor of certain cultures, X-radiation provides a method for the creation of valuable new strains of fungi. There are 28 references.

Inheritance of pathogenicity in *Melampsora lini*, H. H. FLOR. (U. S. D. A. and N. Dak. Expt. Sta.). (*Phytopathology*, 32 (1942), No. 8, pp. 653-669, figs. 2).—Pathogenicity inheritance in this rust was studied by selfing and hybridizing 6 physiologic races—3 heterozygous and 3 homozygous for pathogenicity. The segregation of selfed cultures of heterozygous races indicated each parent race to be heterozygous for a single pair of factors conditioning pathogenicity to 1 variety. The avirulence of race 6 on Akmolinsk and of race 20 on Buda were inherited as dominants. The moderate virulence of race 9 on Williston Golden was dominant to avirulence. Races differing in virulence on each of the 11 differential flax varieties were hybridized. In the F_1 , avirulence was invariably dominant, although on Buda it was incomplete. Consequently, the F_1 hybrid resembled the weaker of the 2 parents in pathogenicity or combined the less virulent characteristics of each. In a cross between races 6 and 24, 96 F_2 cultures segregated for infection types on Buda, Akmolinsk, and Bombay. The segregation for pathogenicity of these cultures was explained by assuming that infection type on Buda, which has 2 pairs of factors for resistance to race 6, was conditioned by 2 pairs of quantitative factors, and that infection type on Akmolinsk and on Bombay, each possessing a single pair of factors for rust reaction, was conditioned by single independent pairs of factors with avirulence dominant. The pair of factors conditioning virulence on Akmolinsk was closely linked with one of the pairs of factors for avirulence on Buda. Pathogenic characters in *M. lini* appear to be mendelian, and the pathogenic range of each physiologic race seems to be conditioned by pairs of factors that are specific for each pair of resistant or immune factors of the host variety. There are 17 references.

[Papers on animal genetics and physiology of reproduction] (*Anat. Rec.*, 82 (1942), No. 3, pp. 394-395, 397-398, 401, 402-403, 412-413, 414, 415, 422-423, 424, 429, 430, 432, 437, 441, 444-445, 447, 453-454, 458-459, 460-461, 462, 463, 465, 466-468, 471-472, 473-474, 475, 479, 482-484, 493).—Abstracts of the following papers on various phases of animal genetics and physiology of reproduction presented at the annual meeting of the American Association of Anatomists are included: Qualitative Differences Between the Morphogenetic Actions of Testoid Compounds, by S. Albert and H. Selye (p. 394); Relationships of Egg, Ovary, and Oviduct in the Albino Rat, by R. H. Alden (pp. 394-395); Further Studies of the Ovaries and Genital Tract at and Shortly after Ovulation, by E. Allen (p. 395); Maintenance of Deciduumata in the Mouse by Administration of Progesterone, by W. B. Atkinson (pp. 397-398); The Attainment of Sexual Maturity in the Female Rat, by R. J. Blandau, W. L. Money, J. R. Ring, and C. Fales (p. 401); Variations in the Rabbit Ovulation Response to Plant Juice Extracts, by J. T. Bradbury, J. W. Mitchell, and R. Borasky (p. 402), and Sex Maturity Factor in Plant Juices, by E. T. Gomez (p. 415) (both U. S. D. A.); The Oxygen Consumption of Skin During the Hair Cycle in the Normal Rat and After Adrenalectomy in Underfed Rats, by E. O. Butcher (p. 403); An Analysis of the Source of Melanophores in the Regenerating Feathers of Barred Plymouth Rocks, by J. G. Foulks (pp. 412-413); Mammary Growth in Hypophysectomized Male Mice, by W. U. Gardner and A. White (p. 414); The Effect of Progesterone Upon the Uterus of the Mouse, by C. W. Hooker (p. 422); Mitotic Activity in the Thyroid Gland of Female Rats During Different Phases of the Oestrous Cycle, by T. E. Hunt (p. 423); The Action of Diethylstilboestrol on Adrenalectomized and Hypophysectomized Rats, by R. G. Janes (p. 424); Response of Hypophysectomized Male Guinea Pigs to Pregnant Mare Serum, by

J. H. Leatham and E. C. Webster (p. 429); Lobulo-Alveolar Mammary Growth in Hypophysectomized Rats, by W. R. Lyons, M. E. Simpson, and H. M. Evans (p. 430), and Bioassay of the Pituitary Growth Hormone Using the Epiphyseal Cartilage of the Tibia in the Hypophysectomized Rat, by M. E. Simpson, E. A. Kibrick, and W. Marx (p. 447) (both Univ. Calif.); The Effects of Antigonadotrophic Serum on the Early Postnatal Development of the Male Rat, by H. N. Marvin and R. K. Meyer (p. 432) (Univ. Ws.); Interstitial Cell Stimulation and Luteinization Under the Influence of Male and Female Hypophyses, by C. A. Pfeiffer (p. 437); Post-Hatching Migration of Pigment Cells Into Skin Grafts Deprived of Their Normal Source of Melanophores, by M. E. Rawles (p. 411); A Study of the Uterine Weight Response to Chorionic Gonadotropin, by J. P. Schooley (pp. 444-445) Relation of Ovary, Hypophysis, and Sex Hormones to Mammary Involution, by W. L. Williams (p. 453); Modification of Reproductive Capacity in Female Rats Treated Prepuberally With Oestrogen, by J. G. Wilson (pp. 453-454); The Effects of Thyroidectomy on Feather Pattern in Brown Leghorn Fowl, by B. Blivaiss and L. V. Domm (p. 458); Genetic Factors Influencing Lung Lobation in the Mouse, by S. Browder (pp. 458-459); Autoplastic Ocular Grafts of Anterior Pituitary in the Guinea Pig, by E. Cutuly and H. O. Haterius (pp. 460-461); Injections of Certain Plant Growth Substances in Rats and Chick Embryos, by W. S. Dye, Jr., M. D. Overholser, and C. G. Vinson (p. 461) (Univ. Mo.); Comparative Effects of Stilboestrol and Oestrone on the Pituitary of Rats, by F. E. Emery (p. 462); Hereditary Factors Which Condition the "Light Oestrous" Response in the Albino Rat, by J. W. Everett (p. 463); A Case of Double Notochord in a Pig Embryo, by W. C. George (p. 465) (Univ. N. C.); Further Observations Upon the Parathyroid Gland of the Virginia Deer, in Specimens Taken at Intervals Throughout the Year, by A. L. Grafflin (pp. 466-467); The Effect on the Embryo of X-Radiation of Mammalian Sperm, by M. Henson (pp. 467-468); Some Reactions of the Omentum of the Albino Rat to Grafts of Embryonic Pig Spleen, by E. A. Holyoke (p. 468), and The Origin of Ova and Follicle Cells From the Germinal Epithelium in the Ovary of the Albino Rat as Demonstrated by the Selective Staining of the Germinal Epithelium With India-Ink, by J. S. Latta and E. S. Pederson (pp. 473-474) (both Univ. Nebr.); Leukemia in the F Strain of Mice.—Studies on Genetic Factors and Foster Nursing, by A. Kirschbaum (pp. 471-472) (Univ. Minn. et al.); The Weight of the Heart and the Lungs in the Fetal, the Newborn and the Adult Cat, by H. B. Latimer (p. 473); Effects of Diethyl-Stilboestrol on the Reproductive Organs of Female Guinea Pigs, by W. O. Nelson (p. 475); Crystalloids in the Hypophysis of Certain Equidae, by F. K. Oldham (p. 475); The Reaction of the Testis to Synthetic Androgens, by L. J. Wells (p. 479) (Univ. Minn.); The Embryology of Cervical Vertebrae in the Chick, by J. L. Williams (p. 479); The Prevention of Castration Changes in the Pituitaries of Gonadectomized Rats as a Common Action of All Steroid Hormones, by E. Clarke, S. Albert, and H. Selye (pp. 482-483); Demonstration of the Sex-Inverting Power of the Sex Hormones, by V. Danchakoff (pp. 483-484); and The Effect of Sex Hormones on Sexual Behavior in Domestic Fowl, by L. V. Domm and D. E. Davis (p. 493).

[Animal reproduction and breeding investigations by the Indiana Station] (*Indiana Sta. Rpt. 1941*, pp. 45, 58, 90-92).—Results are briefly reported by F. N. Andrews, N. E. Weitkamp, J. F. Bullard, R. E. Erb, M. R. Zelle, C. M. Vestal, W. M. McVey, J. H. Hilton, J. W. Wilbur, J. H. Martin, C. S. Shaffner, C. W. Carrick, W. A. Hiestand, N. C. Wheeler, and E. E. Schnetzler of projects on the reproductive organs and semen production of bulls; the effect of thyroxine on milk secretion in beef cattle; breeding Landrace-Duroc and Chester White

swine and crosses between them; factors influencing fertility in bulls; preservation of fowl sperm by cooling and freezing; the influence of temperature and season on production of spermatozoa by fowls; production by breeding of market-type Plymouth Rocks; and breeding Leghorns for viability.

Heritability of conformation in Poland China swine as evaluated by scoring, H. H. STONAKER and J. L. LUSH. (Iowa Expt. Sta. coop. U. S. D. A.). (*Jour. Anim. Sci.*, 1 (1942), No. 2, pp. 99-105).—The scores of 1,460 pigs based on six items—health and vigor, quality, length of body, details of conformation, animal as a whole, and market grade—recorded in spring and fall litters over a 3-yr. period at the U. S. Regional Swine Breeding Laboratory showed that the last three seasons averaged 1.5 points higher than the first three. A perfect score for each item was 9. Treatment of the variance showed that 7 percent was between seasons, 11 percent between progeny averages of the contemporary sires, 11 percent between litter averages, and 71 percent between litter mates. With a calculated heritability of 20 percent and with the parents scoring 3.55 points higher than the average of the population in the season in which they were raised, it was estimated that the average score would increase 0.71 point per generation. The number of pigs raised per litter by a sow to 225 lb. tended to increase by 0.05 for each point increase in the score of the sow as a gilt.

Genetic resistance to brucellosis in swine, H. S. CAMERON, E. H. HUGHES, and P. W. GREGORY. (Univ. Calif.). (*Jour. Anim. Sci.*, 1 (1942), No. 2, pp. 106-110).—From a study of the genetics of resistance of swine to a uniform oral dose of *Brucella suis* of constant virulence (E. S. R., 84, p. 819), a working hypothesis was proposed that resistance is recessive and monofactorial with a penetrance of about 77 percent. Undetermined reactions because of agglutination to low dilutions but not in higher dilutions at 8 weeks of age made some of the conclusions tentative. Among 23 litters from resistant \times resistant parents, there were 98 resistant, 1 susceptible, and 29 partially reacting progeny.

A pale variation in a ground squirrel: Notes on a pale individual of the thirteen-striped ground squirrel *Citellus tridecemlineatus tridecemlineatus*, (Mitchill), E. FICHTER and L. D. DAVIS. (Univ. Nebr.). (*Jour. Hered.*, 33 (1942), No. 4, pp. 153-155, fig. 1).—In a litter of six 13-striped ground squirrels found in nature there occurred one lighter-than-normal individual. Although there were no breeding tests, the condition was considered due to a recessive gene.

A new type of autosomal nakedness in the domestic fowl, P. D. STURKIE. (Ala. Expt. Sta.). (*Jour. Hered.*, 33 (1942), No. 5, pp. 202-208, figs. 2).—A dominant type of nakedness in the domestic fowl which was somewhat variable in character but resulted from a complete absence of pterylae in the areas concerned is described. The alar wing tract was always normal, and the leg or crural tract was only partially devoid of feathers. Matings of the progeny of heterozygous naked δ s with normal ? s produced 958 naked to 961 normals. Matings of naked ? s with normal δ s also proved naked to be autosomal and dominant. F₂ matings further showed the usual 3:1 ratios. In accordance with Fisher's theory of modifiers of dominance in the fowl (E. S. R., 64, p. 330), the progeny of 5 naked sires were found to show significant differences in the character of nakedness in their progeny. Some of the modifiers seem to be sex-linked, but selection seemed without effect. Among eggs producing normal and naked chicks 90 percent and 87.6 percent, respectively, hatched. Mortality was much higher than normal in naked chicks, being 54.1 percent at 10 days of age for naked as contrasted with 2.1 percent for normals. Lethality was not related to the degree of feathering. The weights and feed consumption of naked birds were consistently lower than those of normals at comparable ages from 3 to 24 weeks. Egg production of naked and sexual maturity of ? s was normal.

The regression of the avian post-ovulatory follicle, D. E. DAVIS (*Anat. Rec.*, 82 (1942), No. 3, pp. 297-307, pls. 2).—The regression of the post-ovulatory follicle in bird ovaries, primarily from 17 Argentine Cowbirds, is described. During the regression process the granulosa became vacuolated and phagocytosed. The post-ovulatory follicle of birds is not identical with the corpus luteum of mammals because there is no proliferation or hypertrophy of the granulosa tissue since this structure regresses and undergoes phagocytosis after ovulation.

Auto-sexing in the domestic pigeon, W. F. HOLLANDER (*Jour. Hered.*, 33 (1942), No. 4, pp. 135-140, fig. 1).—Autosexing in the pigeon is possible with the sex-linked factors almond and faded. The hemizygous almond ♀ is white flecked, and the condition increases with age. The homozygous ♂ generally showed the flecks more extensively. Faded had a more general utility because in young squabs the ♂ showed a shorter down and nonpigmented beak. In adults the homozygous ♂ was white with a slight but general pigmentation. The hemizygous ♀s were of normal coloration but faded. The use of faded for sex identification is recommended.

Relationship between body size and metabolism, F. W. WEYMOUTH, J. FIELD, II, and M. KLEIBER. (Univ. Calif. et al.). (*Soc. Expt. Biol. and Med. Proc.*, 49 (1942), No. 3, pp. 367-370).—Recalculation of the relation of metabolism and body size (E. S. R., 86, p. 663) led to the conclusion that the mechanism of respiratory regulation must account for variations from tissue to tissue, species differences, similar relation of body and oxygen consumption, and relation of respiration to body size in separated and intact tissues. The metabolism of the several tissues parallels that of the animals as a whole.

Twinning in horses, L. H. BLAKESLEE and R. S. HUDSON. (Mich. Expt. Sta.). (*Jour. Anim. Sci.*, 1 (1942), No. 2, pp. 155-158, fig. 1).—From 174 parturitions of Belgian and 229 of Percheron mares in the college herd only 2 mares produced surviving twins. The sex ratio was approximately equal.

Chemical studies of bull spermatozoa: The methionine content of whole spermatozoa and of the parts obtained by physical means, C. A. ZITTLE and R. A. O'DELL (*Jour. Biol. Chem.*, 141 (1941), No. 1, pp. 239-243).—Most of the sulfur found in bull sperm was accounted for by the methionine and cystine present in the sperm heads, middle pieces, and tails, as ascertained by physical separation of the parts.

Effect of diluters and storage upon fecundity of bovine semen, G. K. L. UNDERBERG, H. P. DAVIS, and R. E. SPANGLER. (Nebr. Expt. Sta.). (*Jour. Anim. Sci.*, 1 (1942), No. 2, pp. 149-154).—In a study of 931 cows artificially inseminated with bovine semen, undiluted and diluted with fresh and stored egg yolk buffer and autoclaved milk, the treatment accorded these samples did not cause a significant lowering of the conception percentages as contrasted with controls. Despite the maintenance of sperm motility, stored groups showed a significant departure in conceptions from the fresh materials. Evidently the treatments had little beneficial effect on fecundity, but other factors were in operation during storage which caused a loss of the fertilizing capacity regardless of the retention of motility.

The effect of sex on the development of the pig.—II, Urinary excretion of androgens by boars of different lines of breeding, W. W. GREEN, L. M. WINTERS, J. R. RASH, JR., and D. L. DALEY. (Minn. Expt. Sta. coop. U. S. D. A.). (*Jour. Anim. Sci.*, 1 (1942), No. 2, pp. 111-115).—Continuing this series (E. S. R., 87, p. 210), determination of the urinary androgen excretion by boars showed individual variations, but boars of one inbred line excreted much more androgen than boars in another line. In the conduct of the study 105 48-hr. urine samples were assayed by the capon comb test and by the colorimetric method. A correlation coefficient of 0.8 was found between these results.

A comparison of the reactions of male and female rat prostate transplants. D. PRICE (*Anat. Rec.*, 82 (1942), No. 1, pp. 93-113, pls. 2).—Prostatic tissue from ♂ and ♀ rats showed similar development in ♂ and ♀ hosts, and therefore it was assumed that both react to androgens of testicular and presumably adrenalin origin. Subcutaneous transplants were made in 164 hosts from a strain in which approximately 27 percent of the ♀s have ♀ prostates. Tissues from either sex of animal responded equally well to testicular androgens.

Effects of testosterone propionate in spayed female rats. G. L. LAQUEUR (*Soc. Expt. Biol. and Med. Proc.*, 49 (1942), No. 3, pp. 425-426).—Injection of testosterone propionate on alternate days into ♀ rats spayed in oestrous and dioestrous prevented castration atrophy of the uterus. Castration apparently inhibited the increase in body weight found in controls. The study was conducted with six groups of six rats each castrated at different stages of the oestrous cycle.

Mitotic activity in the anterior hypophysis of female rats. T. E. HUNT (*Anat. Rec.*, 82 (1942), No. 3, pp. 263-276).—Mitotic activity in the hypophysis of the ♀ rat was shown to decline from about 90 per square millimeter at 1 day of age to 1-6 mitoses in a comparable section at more advanced ages. After sexual maturity the number of mitoses depended on the stage of the oestrous cycle, but maximum activity was not found in animals over 111 days of age. In pro-oestrous and dioestrous there were relatively few mitotic figures, but during the latter half of oestrous as many as 72 mitoses per square millimeter were found. These conclusions were derived from histological study of hypophyses from 67 ♀ rats.

The origin of ova in the adult opossum. N. B. EVERETT (*Anat. Rec.*, 82 (1942), No. 1, pp. 77-91, pls. 3).—Histological study of the ovaries of 32 sexually mature opossums showed that new ova were formed during adult life in the germinal epithelium. Few new ova were produced during pregnancy and oestrous, most being formed in the nonpregnant animal during the close of the anoestrous period. The cytology and development of ova are described and illustrated.

Maturation, fertilization, and early cleavage in the hen's egg. M. W. OLSEN. (U. S. D. A. and Md. Expt. Sta.). (*Jour. Morphol.*, 70 (1942), No. 3, pp. 513-533, pls. 2).—Study was made by serial sections of developmental changes which occurred in more than 300 blastodiscs in various stages during development in the ovaries or oviducts of White Leghorn and Rhode Island Red hens. Various cytological changes in the developing and fertilizing ova were described. Within 4 hr. after an egg enters the uterus cleavage of the blastodisc has progressed from the sixteenth to approximately the two hundred and fifty-sixth cell stage.

Relation of time of insemination to percent fertility. O. K. MOORE and T. C. BYERLY. [Md. Expt. Sta.]. (*Poultry Sci.*, 21 (1942), No. 3, pp. 253-255, fig. 1).—Variations in the time of insemination were found to determine the percentage fertility of 1,046 eggs incubated in these studies. When birds had a hard-shell egg in the uterus there was a tendency toward low fertility, the average mean percentage being 39. When an egg had just been laid and the birds were artificially inseminated 59 percent proved fertile, and it was considered that the maximum fertility followed 3-4 days after insemination.

The problem of distinguishing the sex of day-old chicks. W. C. THOMPSON and L. M. BLACK (*New Jersey Stat. Cir.* 433 (1942), pp. 11, figs. 7).—Descriptions are given of the methods of sexing day-old chicks, Wax models of differences found, with morphology of the everted vents with accuracy attained in the different types, are presented.

FIELD CROPS

[Field crops research in Idaho, 1941]. (Partly coop. U. S. D. A.). (*Idaho Sta. Bul.* 244 (1942), pp. 18-19, 20, 21-23, 43-47, 49-51, 58-62, fig. 1).—Agronomic experimentation at the station and substations (E. S. R., 85, p. 750), reported on briefly by D. K. Schultz, K. H. W. Klages, D. Peterson, G. O. Baker, E. VanSlyke, C. F. Dietz, L. Verner, C. Arnold, J. L. Toevs, J. E. Kraus, E. W. Whitman, G. Rothwell, J. M. Raeder, R. E. Knight, and W. A. Moss, included breeding work with wheat, oats, barley, alfalfa, potatoes, and corn; variety tests with winter and spring wheat, barley, oats, corn (and hybrids), alfalfa, potatoes (and seed stocks), grain sorghum, sorgo, forage grasses, and pasture mixtures; experiments on the production of seeds of grasses and clovers; cultural experiments with potatoes and different grasses; seedings of grasses and legumes on burned-over land; fertilizer trials with potatoes and grasses; influence of soil management and crop rotation practices on yields of wheat; measuring potato tuber growth with a new device; hastening maturity of potato tubers by killing vines with chemical sprays; and grade, storage, and cooking quality studies with potatoes.

[Farm crops experiments in Indiana]. (Partly coop. U. S. D. A.). (*Indiana Sta. Rpt.* 1941, pp. 17-18, 31-42, 49, 50, 51, 53-54, 87, 102, 103, fig. 1).—Research with field crops and related studies (E. S. R., 86, p. 32) at the station and outlying farms, reported on briefly by D. M. Doty, G. D. Scarseth, C. L. Comar, H. E. Jones, H. A. Nash, S. R. Miles, M. S. Bergdoll, C. E. Skiver, R. R. Mulvey, G. P. Walker, W. W. Worzella, M. Drake, R. E. Lucas, U. S. Jones, H. L. Cook, A. J. Ohlrogge, B. A. Krantz, G. H. Cutler, A. H. Probst, G. O. Mott, A. M. Brunson, R. M. Caldwell, L. E. Compton, R. E. Lincoln, R. W. Samson, J. L. Roberts, F. R. Olson, G. M. Smith, A. J. Ullstrup, F. C. Gaylord, K. I. Fawcett, and A. T. Wiancko, comprised variety tests with corn and hybrids, popcorn, wheat, oats, sorgo, and potatoes for quality; breeding work with corn and hybrids, popcorn, wheat, oats, soybeans, potatoes, and red clover; inheritance of characters in wheat; investigations on the correlation between yielding ability in hybrid field corn and susceptibility to *Diplodia* stalk rot; inheritance of seedling resistance to leaf rust in Wabash wheat; fertilizer experiments with corn, wheat, soybeans, and alfalfa, and various crops in rotation; chemical composition and nutritive value of corn as related to soil type and fertilizer treatment; effects of soil, climate, and maturity on the composition of hybrid and open-pollinated varieties of dent corn; corn fertilization problems involving the use of ammonium sulfate; cyanamide as a source of N for corn and residual effects on oats; fertilizer placement with corn and soybeans; effects of top dressing of N carriers and manure and efficiency of P carriers on wheat; the fertility value of cornstalks; effect of different systems of manuring wheat and corn; residual effects on hay fields of fertilizer applied to wheat and crop residues; effect of tile drainage on hay yield and quality on Clermont silt loam; availability of P to soybeans; grain farming v. livestock farming; clover v. timothy as a rotation hay crop; interrelationships of legumes and grasses grown in associations; factors affecting winter hardiness, yielding ability, and milling and baking qualities of wheat; adaptation of Atlas sorgo as a silage crop in southern Indiana; value of sweetclover as an intercrop in a rotation of corn and oats; harvesting sweetclover for hay v. intercropping; planting tests with corn and soybeans; and pasture experiments, including agronomic study of various species and varieties of pasture plants and mixtures, fertilization of permanent pasture under southern Indiana conditions, a study of the adaptation of rotation pastures of different kinds and of permanent pasture to beef cattle production, and the effects of fertilization upon the composition and production of permanent bluegrass pasture.

[Farm crops research in Mississippi] (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), Nos. 5, pp. 1-2, 3-6, 7, 8, figs. 9; 6, pp. 1, 2, 7, 8).—Articles reporting agronomic research are given as follows:

No. 5.—Fertilizer and Cropping History: Influence on the Present Fertility Needs, by W. B. Andrews (pp. 1, 8); Harvesting Winter Legume Seeds To Meet Farm Needs (p. 1), Cultural Practices for Cotton Grown on Buckshot Soils (p. 2), and Fertilizer Tests for Cotton Growing on Delta Loam Soils (p. 7), all by R. Kuykendall; and Growing Peanuts To Meet War Needs, by R. Coleman and H. O. West (pp. 1, 3-6).

No. 6.—Cultivation Schedule for Cotton Crop, by R. Woodburn (pp. 1, 2); Timely Mowing for Control of Weeds, Improved Pastures, by H. W. Bennett (pp. 1, 8); and Thoro Cultivation for the Eradication of Johnson Grass, by O. A. Leonard (p. 7).

Grassland maintenance in Vermont.—I, A preliminary study, D. E. DUNKLEE and A. R. MIDGLEY (*Vermont Sta. Bul.* 484 (1942), pp. 14, pls. 4).—Grassland on five soil types received fertilizer treatments on the sod in late fall and early spring, but no seed was sown. Yields when cut as hay and pasture were recorded, 1937-40. Complete fertilizer (10-10-10) resulted in outstanding improvement in dry-matter yields, vegetative composition, and herbage quality. N used alone, as cyanamide, calnitro, or urea, was not effective in prolonging or stimulating the life of grass-hay stands. Early spring applications of complete fertilizer usually were superior to those made in the late fall. Cut as hay, herbage yields were practically twice as much as when harvested as pasture. Complete fertilizer increased growth in early spring as well as in the summer dry period, but did not change the peak. Other trials with 14 seeds mixtures on uniformly fertilized and grazed plats demonstrated that the vegetative composition was determined by the plant-food level and by grazing management rather than by the nature of the several mixtures.

High quality hay production, G. H. AHLGREN and C. B. BENDER (*New Jersey Stat. Otr.* 440 (1942), pp. [4]).—Cultural and fertility practices before cutting and curing and handling and storage practices after cutting are outlined, with high-quality hay as the objective. The stages of maturity for cutting different hay crops are tabulated.

The relation of the dispersion ratio to the type and amount of pasture vegetation, G. M. BROWNING and H. G. FOGLE. (W. Va. Expt. Sta. coop. U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 42-44, figs. 6).—The authors show the existence of highly significant negative correlations between the dispersion ratio and the percentage of desirable species ($r = -0.222$), dispersion ratio and the organic matter content ($r = -0.641$), dispersion ratio and the pH ($r = -0.240$), organic matter and bare space ($r = -0.424$), and desirable species and bare space ($r = -0.580$). A highly significant positive correlation ($r = 0.401$) was found between the dispersion ratio and the percentage bare space. In general, increase in the percentage of desirable species, the organic matter content, or the pH was accompanied by a decrease in the dispersion ratio, whereas increase in the percentage of bare space resulted in increase of the dispersion ratio. The use of lime and superphosphate in addition to proper management practices materially increases the carrying capacity and reduces losses of soil and water by improving the type and density of the vegetative cover.

The effect of lime and fertilizer on the composition and yield of pasture herbage in Alabama, J. W. MCCLENDON and E. L. MAYRON. (Ala. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 6 (1941), pp. 285-287).—The yield and mineral content of pasture plants were increased greatly by lime and fertilizer on the soil types studied, 1938-40, at three substations. Fertilizer applied once in 3 yr. was

superior to the same amount divided into three annual applications in all experiments. K became a limiting factor on the alkaline soils of the Black Belt where heavy rates of P were applied. Regardless of fertilization, the quality of plants from the Gulf Coast Substation did not exceed that of plants from unfertilized checks at the Black Belt Substation. A similar relation held in regard to plants from the Black Belt Substation and those from unfertilized checks at the Tennessee Valley Substation.

Some effects of black locusts and black walnuts on southeastern Ohio pastures, R. M. SMITH. (U. S. D. A.). (*Soil Sci.*, 53 (1942), No. 5, pp. 385-388, figs. 6).—The effect of trees upon pasture grasses represents the net result of the reduced light, the tree leaf fall, the tree root competition with the grass and with weeds, and the many indirect reactions of these factors through soil condition, soil moisture, soil temperature, and soil organisms. Whether this net effect is beneficial or detrimental depends upon the type of pasture, the type of soil, the climate, and the season, as well as upon the type of tree. For southeastern Ohio a tree should possess approximately the following characteristics: Its period of leaf activity should extend only from about June 15 to September 15; its canopy should admit approximately 50 percent of the bright open sunlight to the grass during its period of leaf activity; its leaves should be small, fragile, and very high in minerals and nitrogen; its root system should extend to a great depth and be highly developed but should feed mainly below the surface 4 in. of soil; it should be a nitrogen-fixer; it should be capable of establishment on poor upland sites; and it should possess high commercial value. The black walnut approaches the ideal in more ways than any other common species. Its greatest weakness is its inability to fix atmospheric nitrogen. The black locust approaches the ideal in more ways than most other common trees, foremost among its desirable characteristics being its ability to fix atmospheric nitrogen.

Some factors affecting the content, fluctuation, and distribution of white clover in permanent sod areas in Ohio, D. R. DODD. (Ohio Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 6 (1941), pp. 288-297, figs. 13).—Experiments contributed information on factors affecting the fluctuation and distribution of white clover in the permanent sod lands. White clover was very valuable in permanent sods since it improved the quality, the growth, and color of the sod and helped to control weeds. Where lime was not abundant in the surface soil, liming was essential to satisfactory development of white clover, and the need for P a close second. Considerable differences were noted among white clover strains in general characteristics, growth habits, and ability to endure unfavorable weather. Control of grass growth in pastures and lawns is necessary to the maintenance of a satisfactory white clover content. This clover content of permanent sod areas fluctuates in response to weather.

Other studies and experiments in the program of the San Joaquin Experimental Range, M. W. TALBOT, H. H. BISWELL, P. B. ROWE, and A. W. SAMPSON (*California Sta. Bul.* 663 (1942), pp. 136-142).—Brief descriptions are given of the purpose, nature, and scope of studies concerned with artificial reseeding, rainfall runoff and erosion, and the chemical composition of the important range plants.

The forage crop and its management, M. W. TALBOT and H. H. BISWELL (*California Sta. Bul.* 663 (1942), pp. 13-49, figs. 5).—The forage on the San Joaquin Experimental Range is described, with discussion of its characteristic growth and behavior and a report on experiments on grazing to give maximum yields with concurrent maintenance and possible improvement. Progress results show that new green growth was available from 2 to 3 weeks earlier on areas

where some old feed was left for protection than on areas closely used the previous season. Forage composition and density were not affected appreciably in 3 yr. by different rates of use for the grazing period of about 7 mo. each year. Surface soil litter decreased on the most closely used areas. This annual forage cover under certain conditions might change very readily if completely protected from grazing.

Alfalfa breeding, H. M. TYSDAL, T. A. KIESSELBACH, and H. L. WESTOVER. (Coop. U. S. D. A.). (*Nebraska Sta. Res. Bul.* 124 (1942), pp. 46, figs. 14).—Information on the improvement of alfalfa (E. S. R., 85, p. 614) is assembled and suggestions are made on future possibilities. The objectives of breeding, relation of characters, and the genetics and cytology of alfalfa are reviewed briefly. New data reported, obtained through the cooperative breeding program, provide information on the amount and manner of natural crossing, the effects of inbreeding and hybridization, and the possible commercial utilization of hybrid vigor in alfalfa. Improvement practices examined comprise (1) mass selection with its modifications of strain-building and maternal-line selection, (2) recombination of selected inbred lines as synthetic varieties, and (3) hybridization for use as F_1 hybrids, with the respective resultant improved products known as (1) improved selections or strains, (2) synthetic varieties, and (3) F_1 hybrids. Concluding that the principles of breeding alfalfa, with some modifications, are essentially the same as those established for corn, the authors outline a program to develop either a superior synthetic or a hybrid including the following steps: Careful choice of the original varieties; epidemic, breeding, and polycross nurseries; and production of hybrid alfalfa. Literature cited embraces 43 titles.

Bronco grass (*Bromus tectorum*) on Nevada ranges, C. E. FLEMING, M. A. SHIPLEY, and M. R. MILLER (*Nevada Sta. Bul.* 159 (1942), pp. 21, figs. 13).—Bronco grass, an annual introduced from Europe, first appeared in Nevada about 50 yr. ago as a weed of roadsides and alfalfa. At present it grows throughout the sheep and cattle ranges in varying degrees of density and has become a permanent source of feed in northern and central Nevada range areas, where it is especially desirable for spring lambing. The grass is a prolific seeder, is not very exacting in soil requirements, can compete successfully with perennial range grasses, and is uniform in forage production. Maximum volume of forage is produced by June 15 each year, and the amount per square foot of 10–10 density is influenced greatly by the amount and distribution of spring moisture. Bronco grass is palatable and nutritious to all classes of livestock in the green and succulent stage. If moisture is ample new growth is made after grazing. If soil moisture is available in late summer or early fall, new growth comes from seed produced the preceding spring, and the fall growth is as nutritious and palatable as early-spring growth. The grass was found to compare favorably in nutrient values with the perennial range grasses bluebunch wheatgrass, bluebunch fescue, and Sandberg bluegrass at comparable stages of growth and maturity, although not quite so palatable, and it can withstand untimely and heavy grazing better. The seeds of this grass cause eye and mouth injury to cattle and more so to sheep in summer or fall months. Bronco grass creates a serious fire menace when fully mature and dry, although under Nevada conditions it is not killed out by burnings. It is susceptible to heavy smut infestations which decrease its palatability at maturity.

Hybrids help growers meet production goals on corn in "food-for-freedom" drive, W. H. LEONARD and H. FAUBER (*Colo. Farm Bul.* [Colorado Sta.], 4 (1942), No. 2, pp. 25–27).—Continued trials of corn hybrids (E. S. R., 85, p. 476) showed Iowa 3080, Iowahealth AP, DeKalb 240, Funk G-7, Iowahealth A,

Wisconsin 696, and Pioneer 332, in order, as the high yielders of those tested for 2 yr. or longer, 1937-41, in comparison with Minnesota 13 at Fort Collins. At Rocky Ford, 1937-41, compared with Reid Yellow Dent the ranking was Pioneer 307, Funk G-212 and G-135, Pfister 160, Iowa 160, CI and AQ, and DeKalb 816. The adaptations of these and other hybrids are discussed briefly.

Cation balance in corn grown on high-lime soils in relation to potassium deficiency. G. STANFORD, J. B. KELLY, and W. H. PIERRE. (Iowa Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 6 (1941), pp. 335-341, figs. 5).—In field experiments on high-lime soils the K, Ca, and Mg contents of normal and K-deficient corn plants were compared at different growth stages. Unproductive soils contained less exchangeable K and more Ca and Mg carbonates (expressed as the CaCO_3 equivalent) than the normal soils. A close relation existed between corn yield and the amounts of exchangeable K in the soil. For plant samples at an early stage of growth in 1940 the amount of K absorbed per 100 gm. of dry plant material was correlated closely with the exchangeable K content of the soil. K fertilization reduced the content of Ca and Mg per unit weight of the plant. Greenhouse and field experiments gave evidence that K applied to the unproductive soils repressed the uptake of Ca and Mg by the plants. The Ca + Mg/K ratio in young corn plants sampled in 1940 was a function of the amount of exchangeable K in the soil. Consideration of all plant analyses revealed that Ca + Mg/K ratios of 3.5 or less occurred in apparently normal plants. Ratios of 5 or above were found in plants showing marked symptoms of K deficiency. Poor growth of corn on Iowa high-lime soils appeared due largely to failure of the plants to absorb adequate amounts of K from the soil. A consequence of the low rate of K absorption is an unfavorable balance between cations within the plant.

Kansas corn tests, 1941. A. L. CLAPP, R. W. JUGENHEIMER, H. D. HOLLEMBRAEK, and J. H. LONNQUIST. (Coop. U. S. D. A.). (*Kansas Sta. Bul.* 299 (1942), pp. 47, figs. 2).—Further tests of corn hybrids and varieties under the Kansas corn-testing program (E. S. R., 85, p. 45) were made in 1941. Hybrids (listed alphabetically) yielding above the average of all 35 entries in fields in all 3 eastern districts in 1941 were Iowa 160 TX 1, Kansas 1585, 1624, 1638, and 2232, K. I. H. 38, Reid-Midland, and U. S. 13. During 1940 and 1941 the hybrids standing up as well as the average of the better open-pollinated corn, producing at least 15 percent more corn, and having a combined advantage in lodging resistance and grain yield of not less than 25 percent in all 3 eastern districts, were Funk G-94, Illinois 200, Kansas 1104 and 2232, Pioneer 307 and 332, Pfister 380, and U. S. 13 and 35. Some hybrids that made a high yield in cooperative strip tests in all 3 eastern districts in 1941 were Funk G-94, Illinois 200, K. I. H. 38, Kansas 1104, U. S. 13, and Kansas 1466, and for central Kansas were Kansas 1466, U. S. 13, Kansas 1412 and 11, U. S. 35, and Illinois 200.

Factors in the breeding of cotton for increased oil and nitrogen content. N. I. HANCOCK (*Tennessee Sta. Cir.* 79 (1942), pp. [7]).—Data from varietal studies with cotton in three localities in Tennessee are analyzed and discussed in relation to factors involved in improvement, by breeding, of the oil and N contents of cottonseed. Both the oil and N content of cottonseed have been shown to be definite plant characters stable within the variety but differing significantly among varieties. The inverse relationship of the oil to N character is attributed largely to their noncompatibility with the environment—a wet, cloudy season being favorable to oil but unfavorable to N. Seasons appear to exert more influence upon this inverse relationship than do locations. The possibility of obtaining a variety high both in oil and N content is mentioned.

Mung beans for Oklahoma, H. W. STATEN (*Oklahoma Sta. Cir. 104 (1942)*, pp. 7, fig. 1).—Varieties, adaptation, and cultural and harvest practices are outlined for growing mung beans (*Phaseolus aureus*) for forage, commercial sprouting and canning, and soil improvement. The golden variety, grown primarily for soil building, hay, silage, and pasture, will yield from 1 to 2 tons of air-dry hay per acre and average from 4 to 5 bu. of seed. Green varieties yield from 12 to 15 bu. of seed but only half as much hay as the golden. The bean sprouts are used particularly by the Chinese restaurants for making chop suey, chow mein, and other food.

Winter injury as related to fall and winter growth and crown-rust infection in oat varieties and their hybrids, H. R. ROSEN, L. M. WEETMAN, and C. K. McCLELLAND (*Arkansas Sta. Bul. 418 (1942)*, pp. 17, figs. 4).—Selections of oats hybrids and parental material, including hardiest varieties available, were subject to severe cold during the 1939-40 winter. The survival for all parents was very low, ranging from 28 percent for Tennex to 0 for a number of other varieties. Thirty-eight selections, much hardier than any of the parents, ranged in survival from 40 to 90 percent. Most selections did not surpass the parents, and some did not equal them. More than 5,000 selections of individual plants from hybrids surviving the winter of 1939-40 and having other desired characters, particularly crown rust resistance, were planted early in September 1940, and, with favorable conditions lasting for 2 mo., made good growth. A severe epidemic of crown rust developed, and all susceptible selections and susceptible parent varieties became infected, varying from a trace to over 50 percent. During rapid growth and before the plants could harden the temperature fell to 24° F. on November 11 and remained below freezing during most of the next 6 days, reaching a low of 9°. Many nonhardy selections and parents were completely killed, while harder parents showed from 85 to 70 percent leaf injury, some of which could be attributed to reduction in hardiness due to severe crown rust infection. The many hardy selections showing appreciably less injury than the hardiest parents included some that made considerably more growth for winter pasture than the hardy parents, and were homozygous for resistance to crown rust, some to both crown and stem rust, and to smuts. Oats possessing considerable hardiness evidently can be bred, and such hardiness can be coupled with excellent growth for winter pasture, with rust and smut resistance, and with good grain yields.

Progress report of potato research, J. E. KRAUS ET AL. (*Idaho Sta. Cir. 85 (1942)*, pp. 7).—Brief progress reports are made on studies at the Aberdeen Substation and the station showing that large seed piece and close planting produce best yields, cut seed exposed to hot, dry conditions decays quickly, lack of moisture may cause jelly-end rot, causes for cull grades of commercial potatoes vary, and high temperatures are not favorable for potato storage. Comments are also made on plant symptoms of bacterial ring rot, occurrence of *Fusarium* wilt, improvement and testing of seed stocks, tests of methods of hastening maturity or skin setting on late potatoes, and fertilizer experiments.

Influence of flowering and fruiting upon vegetative growth and tuber yield in the potato, W. L. BARTHOLDI (*Minnesota Sta. Tech. Bul. 150 (1942)*, pp. [1]+20, figs. 3).—That flowering and fruiting both caused significant reductions in vegetative growth and tuber yields was shown in studies with four potato varieties at two locations. Fruiting plants, and to a lesser extent flowering plants, tended to produce a smaller weight of vines than did nonflowering, nonfruiting plants. This was noted in the early developmental growth stages following a period of most active flowering and fruit set. Association between extent of flower and fruit production and vine growth was indicated, although marked de-

creases were observed with the lighter flowering, less fruitful individuals. Growth of underground parts (stolons plus roots) closely paralleled that of vines, and similarly, flowering and fruiting tended to reduce the ultimate size of these portions.

Measurements on total yield of tubers and number of tubers reaching marketable size (over 85 gm.) disclosed that yields were reduced significantly on both fruiting and flowering plants of all varieties as compared to nonflowering, non-fruiting plants. Fruit formation and tuber production were concurrent processes. Decrease in yield appeared to be related to the number of flowers and fruits formed. Yield reductions per gram of fruit set and per flower formed tended to be greater on the lesser flowering and less fruitful plants. Flowering and fruiting evidently reduced total number of tubers set and number and weight of tubers reaching marketable size.

Soil element tests help food-for-freedom program, pointing way to better potatoe, J. G. McLEAN and W. C. SPARKS (*Colo. Farm Bul.* [*Colorado Sta.*], 4 (1942), No. 2, pp. 23-25).—The red color of the skin of Red McClure potatoes, grown in the San Luis Valley, and to a lesser extent of Triumph, grown at Fort Collins, was increased with sulfates of Fe, Cu, and Mn. Zinc sulfate resulted in tubers generally darker than the untreated controls, calcium carbonate and magnesium sulfate showed no effect on color, while sodium carbonate resulted in light red tubers and borax in light colored potatoes, often with a pinto appearance. Various effects on tuber shape were noted. Planting date also exerted some influence on skin color.

A study of problems relating to production of fall-crop Irish potatoes in Oklahoma, H. B. CORDNER (*Oklahoma Sta. Bul.* 258 (1942), pp. 59, figs. 15).—The several causes of crop failures in fall potato production were studied, 1937-40, and certain practices were found helpful in overcoming these failures. Successful production mainly depends upon the development of a good stand of plants, followed by the continuous development and maturation of the crop. See also an earlier report (E. S. R., 84, p. 40).

High soil temperatures, especially 90°-95° F., were decidedly destructive to potato seed. Mean soil temperatures above 90° at planting time resulted in marked reductions in stands. Seed piece break-down at high temperatures appears to originate as a physiological disorder which resembles blackheart in being associated with a high rate of respiration and a deficiency of oxygen in tuber tissues. Therefore, the planting of freshly cut seed pieces was found desirable in securing a satisfactory stand when the soil temperature was high or near the critical point. Definite relationship was observed between rate of sprouting and survival of seed pieces at high soil temperatures, with slow or delayed sprouting associated with low stands. Cut sets were preferred to whole tubers because they sprout quicker.

Refrigerated storage (50°) for spring-crop seed tubers was less desirable than cellar storage (70°-80°), because the cooler temperature caused seed to sprout more slowly after planting. Seed tubers harvested from the spring crop while immature (mid-June) were slower to sprout when planted and were less desirable for seed than tubers which reached full maturity in the field (July 1-6). Planting sprouted seed hastened sprout emergence and with year-old seed (from previous fall crop) greatly improved the stand. Multiple sprouting in this old seed was objectionable, for tuber size was reduced by competition between the several plants in each hill. Presprouted spring-crop seed might have some advantage over unsprouted seed in early plantings but not under better conditions in late plantings. Ethylene chlorohydrin treatment hastened sprouting of spring-grown seed and favored a good stand, especially when whole tubers were planted

throughout the usual planting season but with cut sets only when the plantings were made early (in July).

Time of planting factor as relating to soil conditions was found of major importance. Mortality of seed planted when the soil temperature was high usually was great. Prompt sprouting and emergence was favored in plantings made when the soil temperature was moderated by rainy weather. Irrigation aided in reducing soil temperatures between planting and establishment. Irrigations during post-emergence were especially helpful in stimulating uniformly rapid growth to assure satisfactory yields. Lower soil temperatures for plants irrigated by overhead spray compared to areas irrigated by furrows seemed to account for differences in favor of the spray method. Straw mulch at planting was beneficial in a year when drought and high temperature prevailed but detrimental in another season with heavy rainfall and lower temperatures. High ridges slowed up emergence and also resulted in faster drying of the soil, with consequent lower yields. Moderate to low ridges gave better results. Early sprouting of seed of varieties as Triumph and Warba, combined with their tendency for early maturity, made them more suitable for fall crop production than Cobbler, which has a longer rest period, sprouts more slowly, and requires longer to mature after emergence.

Growing fall-crop Irish potatoes, H. B. CORDNER (*Oklahoma Sta. Cir.* 102 (1942), pp. 15, figs. 5).—Suggestions for improving the fall potato crop, especially kind of seed, treatment of seed, and planting and care of crop, are based on experiments reported above.

Effect of seed treatment on nodulation of soybeans and peas, M. D. APPLEMAN. (Ill. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 6 (1941), pp. 200-203, figs. 2).—Satisfactory nodulation was produced upon pea and soybean plants grown from inoculated seed treated with Semesan, whereas Cuprocid prevented nodulation. Ceresan decreased nodulation on canning peas but not on soybean plants. All nodulation was of the lateral root type where seed disinfectants were used, although taproot nodulation was obtained upon untreated inoculated controls. The organisms were recovered from disinfectant-treated, inoculated seed after a lapse of 24 hr.

Soybean production in Missouri, B. M. KING and D. I. ALLEN. (Coop. U. S. D. A.). (*Missouri Sta. Bul.* 445 (1942), pp. 31, figs. 12).—Practical information is given on soybean varieties, methods of growing and harvesting soybeans for hay and seed, management of the crop in a rotation, and on the soil-fertility relations of the soybean crop. Soybean varieties variously adapted for grain and hay production in different sections of Missouri include for grain Illini, Dunfield, Chief, Scioto, Boone, Manchu, Ral soy, and Arksoy planted at normal time; Dunfield, Illini, Manchu, and Boone planted late or followed by small grain; and for hay Virginia, Wilson, Laredo, or grain types on very rich land.

[Variety tests with sugarcane in Puerto Rico in 1940] (*Puerto Rico Sta. Rpt.* 1940, pp. 51, 51-53).—Work by A. G. Kevorkian is reported on briefly.

A strain of Nancy Hall sweetpotato selected for color of flesh, N. D. PEACOCK, A. MEYER, and A. B. STRAND (*Tennessee Sta. Cir.* 80 (1942), pp. [4], figs. 2).—Strains of Nancy Hall sweetpotatoes selected for flesh color have yielded as high as, and probably surpassed, the common strain. Selection No. 103 appears to be a desirable dark (red-orange) color selection.

Vetch varieties for soil improvement and seed production in Alabama, H. R. ALBRECHT (*Alabama Sta. Bul.* 253 (1942), pp. [2]+15, figs. 6).—Vetches recommended for use in Alabama include hairy (*Vicia villosa*); smooth (*V. villosa* var.); Willamette, an improved strain of *V. sativa*; LaFayette and other hardy strains of monantha (*V. monantha*); woollypod (*V. dasycarpa*);

and *grandiflora* (*V. grandiflora*). All are well adapted to most sections of the State except Willamette, which has not proved satisfactory on the poorer, especially sandy, soils. Monantha, the best seed producer of the recommended vetches, is earlier than hairy vetch and has long produced excellent yields of green matter. LaFayette and other strains of monantha vetch now being developed by the station are hardy enough for use in Alabama. Willamette vetch, earlier and generally producing more seed than hairy vetch, is indistinguishable from common vetch but is more winter hardy. It is more vigorous than Alba, a white-flowered common vetch, but, like the latter, should be planted only on the better, well-drained soils. Woollypod closely resembles hairy vetch in growth habit and has about the same general adaptation. Auburn woollypod, now being multiplied by the station, is earlier than hairy vetch and a superior seed producer. Hungarian (*V. pannonica*), purple (*V. atropurpurea*), and most strains of common vetch are not recommended for green manures in Alabama. Augusta vetch (*V. angustifolia*) is useful whenever a volunteering vetch is required, but *grandiflora* vetch would be recommended instead were more seed available. Cultural methods and seed-harvesting practices, also based largely on station experiments, are outlined, with comments on insects and diseases attacking vetches and their control.

Classification of wheat varieties grown in the United States in 1939. J. A. CLARK and B. B. BAYLES (*U. S. Dept. Agr., Tech. Bul. 795 (1942), pp. 146, pls. 41, figs. 79*).—This publication is a revision of and supersedes Technical Bulletin 459 (*E. S. R., 74, p. 194*). Discussing a total of 212 varieties, it includes 47 new varieties and omits 74 which are no longer considered important.

The effect of terrace ridges on the production of winter wheat. H. J. HARPER. (Okla. A. and M. Col.). (*Soil Sci. Soc. Amer. Proc., 6 (1941), pp. 474-479, figs. 2*).—Effects of terrace ridges on the production of winter wheat in the southern Great Plains region were determined, 1932-34 and 1937-41, on Kirkland loam. On clay pan soils with slopes of less than 2 percent, the upper terrace channel must be drained during periods of excessive rainfall to prevent damage to wheat growing in the flooded area. Beneficial effects from runoff water collecting above a terrace ridge were observed when a deficiency of soil moisture restricted plant development on adjacent land not affected by additional water. Construction of contour-terrace ridges on shallow soils with slowly permeable subsoils does not provide a more favorable condition for crop production, since a reduction of the yield in the terrace channels will occur for several years, depending upon the rate of interterrace erosion. After the terrace ridge has reached a relatively stable condition, an area near the center of the ridge will produce less grain and straw than undisturbed soil in the terrace interval. Exposure of the crop growing on the terrace ridge during winter and a decrease in efficiency of torrential rainfall may be factors partly responsible for this condition.

Drill survey reveals need of seed testing as part of all-out food production effort. B. J. THORNTON (*Colo. Farm Bul. [Colorado Sta.], 4 (1942), No. 2, pp. 3-5, fig. 1*).—Tabulated results of surveys of alfalfa, red clover, sweetclover, barley, oats, and wheat seed being planted by Colorado farmers showed that 85 percent of all the seed samples taken contained noxious weed seeds. Much seed is planted without recleaning.

[Weed control in North Dakota] (*North Dakota Sta. Bmo. Bul., 4 (1942), No. 5, pp. 5-7, 18, fig. 1*).—These papers include a discussion of The Weed Problem, by O. A. Stevens (pp. 5-7), which contains a chart of the factors involved in weed control, and Two Important Factors in Weed Control, by E. A. Helgeson (p. 18).

HORTICULTURE

[Horticultural studies by the Indiana Station]. (Partly coop. U. S. D. A. et al.). (*Indiana Sta. Rpt. 1941, pp. 50, 53, 78-80, 81-83, 85-87, 88-90*).—Brief reports are presented on the following: Breeding tomatoes for resistance to *Fusarium* wilt and to defoliation diseases, both by R. E. Lincoln; breeding of sweet corn, by G. M. Smith; pruning of Golden Delicious apples and variety testing of peaches, plums, and prunes, all by C. L. Burkholder; soil management of peach and apple orchards and storage investigations, all by C. E. Baker; spraying and dusting investigations with the apple and spray residues on apples, both by Burkholder, D. L. Johnson, O. W. Ford, and E. D. Schall; breeding of rhubarb, by J. D. Hartman; tomato seed production, by E. C. Stair; factors involved in the quality of canned tomatoes, factors affecting quality and prices of mint oil, and freezing of fruits and vegetables, all by F. C. Gaylord and K. I. Fawcett; production and marketing of vegetables grown on muck soils, by N. K. Ellis and Gaylord, and on sandy soils, by Hartman and Gaylord; and tomato quality studies, by Hartman and Stair.

[Horticultural studies by the Puerto Rico Station] (*Puerto Rico Sta. Rpt. 1940, pp. 18-19, 22-23, 33-36, 38-43, 50-51, 53-65, figs. 14*).—Reports are presented on the progress of studies on the loss of viability in cinchona seeds and the sensitivity of cinchona seedlings to modifications in light intensity, both by W. Pennock; the productivity and growth of the Columnaris variety of coffee (coop. Puerto Rico Univ. sta.), by J. Guiscafré Arillaga; pruning of *Cananga odorata*, propagation and utilization of bamboo, culture and handling of rotenone-producing plants such as *Derris* and *Lonchocarpus* species, sweet corn production, cantaloup culture, stimulating effect of brewers' yeast on the growth of mangosteen seedlings, productivity of mangosteen trees, structure and development of mangosteen seeds, the introduction and distribution of new plant materials, by C. L. Horn; orchid culture, growing of rattan palms, handling of palm seeds for shipment, and the culture of *Aleurites trisperma* and *Hevea brasiliensis*.

Effect of temperature on the respiration rate and the respiratory quotient of some vegetables, H. PLATENIUS. (Cornell Univ.). (*Plant Physiol., 17 (1942), No. 2, pp. 179-197, figs. 7*).—Wide variations were observed in the respiration rate of 10 different vegetables, e. g. at 24° C. (75° F.) the initial rate of respiration of asparagus was 59 times that of the potato. No correlation could be established between respiration rates of different vegetables and their glucose content or carbohydrate reserves. The type of tissue appeared to play a dominant role in determining respiration rates. In general, respiration rate declined gradually with time at all temperatures. Respiratory quotients in general were highest soon after harvest, and with few exceptions smaller values were found at the lower temperature levels. It is suggested that the low respiratory quotients of certain vegetables, such as spinach and potatoes, may be due to the conversion of carbohydrates to organic acids.

Soil management practices for Peninsula vegetable growers, R. L. CAROLUS. (Va. Truck Expt. Sta.). (*Peninsula Hort. Soc. [Del.] Trans., 55 (1941), pp. 69-72*).—The importance of organic matter in the soil on the yield of white potatoes was shown in studies on 137 farms. On farms where the organic matter content was less than 1 percent there was a net loss. Profits increased as the organic matter increased above 1 percent, leading to the suggestion that potato production be not attempted where organic matter is less than 1.5 percent. Both sorghum and soybeans, uncut for hay, were effective in maintaining the production of potatoes. When kale and collards followed the potatoes, there was a beneficial residual effect of the green manures used on the potatoes. The functions of organic matter in the maintenance of soil fertility are discussed.

Growing vegetables with fertilizer in water, V. A. TIEDJENS and L. G. SCHERMERHORN (*New Jersey Stat. Bul.* 694 (1942), pp. 20, figs. 6).—Many vegetables were grown more efficiently by the application of fertilizers in water than as dry materials. Yields of tomatoes, sweetpotatoes, lima beans, snap beans, sweet corn, celery, and peppers were increased by the use of fertilizer solutions at the time of seeding or setting of the plants. Similar solutions in higher concentrations were used successfully for growing short-season crops to maturity. Applications of side dressing in the form of fertilizers in solution to long-season crops such as tomatoes, sweetpotatoes, and celery were more effective in general than were dry materials. The application of fertilizer in water may lower the unit cost of growing vegetables. The efficiency of fertilizers in water may be due to at least two factors: Greater availability of phosphoric acid and a reduction in injury caused by dry fertilizers. Materials and methods are discussed.

Vegetable varieties for Delta gardens, E. A. CURREY (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 5, p. 8).—Data are presented on the yields of beans, potatoes, tomatoes, eggplants, and peppers, and recommendations are given for variety selections for many other species.

The home vegetable garden, C. H. NISSLEY (*New Jersey Stat. Cir.* 428 (1942), pp. [28], figs. 15).—General information is presented on the planning, preparation, planting, and care of the home vegetable garden.

Anent the origin of sweet corn: *Zea mays*, L. var. *rugosa*, Bonaf., A. T. ERAWIN. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 16 (1942), No. 4, pp. 481-485).—A careful study of early colonial literature and other sources of information led to the conclusion that sweet corn, as now known in the United States, arose as a mutation of field corn in post-Columbian times. In support of this concept the author cites the discovery at the station of a single kernel of sweet corn as a mutant in a controlled series of pedigree cultures of dent corn.

Sweet Spanish onion bulb development most rapid in late August, test shows, A. M. BINKLEY and H. FAUBER (*Colo. Farm Bul. [Colorado Sta.]*, 4 (1942), No. 2, pp. 11-13, fig. 1).—Information is presented on the interrelation of day length and temperature on the bulbing of onions. The period of most rapid bulb development in the Sweet Spanish onion grown at Rocky Ford occurred between August 12 and September 1. The rate of top growth was more regular, except for a rapid growth preceding the beginning of extensive bulb development.

Bounty tomato in standard yield trials in 1940 and 1941, H. MATTSON (*North Dakota Sta. Bul.* 310 (1942) pp. 7).—This new tomato, developed by the station from a cross between Allred and Break o' Day, was introduced in 1941. Yield and grading data showed it to be definitely superior to other kinds ripening in the same season. In 1941 Bounty ranked first in yield of graded fruits from the beginning to the end of the harvest season at both Fargo, N. Dak., and Morden, Manitoba. Good reports were obtained also from various other localities.

New fertilizer practices and starter solutions for Peninsula tomatoes, C. H. MAHONEY. (Univ. Md.). (*Peninsula Hort. Soc. [Del.] Trans.*, 55 (1941), pp. 82-83).—With 500 lb. of a 4-12-8 fertilizer placed in two bands 4 in. deep and 5 in. on each side of the plant and a side dressing of 500 lb. applied 6 weeks after planting as the check treatment, three other forms of application gave significantly lower yields and six other methods gave significantly higher yields than the check. A hazard from the use of starter solutions was observed in the dry season of 1941. Two of three solutions produced definite injury to the plants, while the third, a balanced solution containing some phytohormones to induce rapid root formation, was definitely beneficial.

Tomatoes in the greenhouse, V. A. TIEDJENS and O. W. DAVIDSON (*New Jersey Stat. Cir.* 443 (1942), pp. [4]).—Information is presented on varieties,

soils, culture, pruning, pollination, use of growth-promoting substances to attain fruit setting, control of diseases and insects, etc.

[Leaflets on the home fruit garden] (*U. S. Dept. Agr. Leaflets* 221 (1942), pp. 8, figs. 2; 222, pp. 8, figs. 2; 224, pp. 8, figs. 2).—These leaflets list the best kinds and varieties of fruits and nuts for planting in the regions covered and set forth brief directions for their care. No. 221 covers the central Southwestern States; No. 222 the northern Great Plains, northern Mountain, and Intermountain States; and No. 224 the Pacific Coast States and Arizona.

Minnesota Fruit Breeding Farm.—Report for 1941, W. H. ALDERMAN and F. E. HARALSON. [*Minn. Expt. Sta.*]. (*Minn. Hort.*, 70 (1942), No. 6, pp. 106–107, 111–112).—Data are given on various improvements made possible by W. P. A. aid and on the status of fruit-breeding activities. Several promising new fruits are described.

Substitutes for nitrogen fertilizers in orcharding, A. E. MURNEEK and A. D. HIBBARD (*Missouri Sta. Cir.* 236 (1942), pp. 7).—The prospective shortage of inorganic N fertilizers due to war demands is pointed out, with suggestions as to the greater use of legumes, farm manures, activated sewer sludge, etc., to obtain the essential N. Certain organic materials, such as straw, cotton hulls, and sawdust, may have a detrimental effect due to the fact that the organisms which decompose such materials may take up most of the available N. The need of preventing losses by erosion and leaching is emphasized, and data are presented as to the cultural requirements of various legumes that might be grown in the orchard to provide N.

Studies in framework grafting of mature fruit trees, II–IV (*Jour. Pomol. and Hort. Sci.*, 19 (1942), No. 3–4, pp. 149–167, fig. 1; pp. 168–185, fig. 1; pp. 186–196, pls. 2, figs. 2).—Further contributions are presented (E. S. R., 72, p. 332).

II. *Apples*, R. J. Hilton.—The advantages of rapid reworking of mature fruit trees are discussed, and the principal methods of framework grafting, particularly cleft and bark grafting, are described. Methods of cleft and bark grafting were intermixed on the same tree, and, apart from differences in vigor of growth due to the different types of grafts, there was little evidence of interaction one with the other. The influence of fifteen 10-year-old frameworked intermediates on the vigor of Cox Orange Pippin scions was not markedly different in the first four seasons after grafting. Differences in fruit bud formation and cropping were more noticeable.

III. *Plums*, R. J. Hilton and T. N. Hoblyn.—Cleft- and bark-grafting methods, compared by grafting 7 scion varieties on 14-year-old Czar plum trees, indicated that cleft grafting was superior to bark grafting. There was considerable loss of scions in the first season from a summer gale, suggesting the need for some pruning of scions. There were differences in the growth and cropping of the 7 scion varieties, but the results were complicated by a large variation in successful unions. Tests of the intercompatibility of 23 scion varieties and of 3 intermediates yielded no clear-cut evidence of incompatibility in any of the 69 combinations, despite the fact that one of the intermediates and some of the scion varieties were known to be incompatible when worked on certain rootstocks.

IV. *A comparison of frameworked and topworked apple trees*, R. J. Garner.—A group of 13-year-old trees of Newtown Wonder, an apple susceptible to silver-leaf disease, was grafted with scions of Laxton Superb. Of the four methods employed, rind grafting was followed by the most breakage, most disease, and lowest yields. Frameworked trees lost no scions by breakage and suffered less from disease, with new scion growth considerably greater than in the rind-grafted

trees. The frameworked trees bore heavily in the third season and continued to produce more fruit than those top-worked by any other method.

Thinning fruits for vigor of the trees, quality of products, T. E. ASHLEY (*Miss. Farm Res. [Mississippi Sta.], 5 (1942), No. 5, p. 7*).—Information is presented on the thinning of the fruit of the peach, plum, and apple.

Promising new apple variety is introduced (*Idaho Sta. Bul. 244 (1942), pp. 20-21*).—A promising new variety, Idared, developed by the station from a cross between Wagener and Jonathan, is described by L. Verner.

Rootstocks for apple trees, E. W. GREVE. (Univ. Del.). (*Peninsula Hort. Soc. [Del.] Trans., 55 (1941), pp. 36-38*).—In 1929, an orchard of five varieties—Yellow Transparent, Grimes Golden, Delicious, Stayman Winesap, and Rome Beauty—half on their own roots and half on French crab seedlings, was established at the Delaware Experiment Station. Half the trees in each group were never pruned and half were pruned regularly. Yield data presented for unpruned Grimes Golden, the most productive of all five varieties, showed the seedling-rooted trees to have been the more productive. Observations are presented on the behavior of Blaxtayan and Gallia Beauty trees growing on six different Malling rootstocks.

Progress toward a more scientific basis for orchard fertilization, D. BOYNTON. (Cornell Univ.). (*N. Y. State Hort. Soc. Proc., 87 (1942), pp. 192-198*).—Studies of the relation between leaf N, fruit color, and yield made in a large number of New York McIntosh apple orchards showed that as the percentage of leaf N increased the proportion of orchards producing fruit averaging 50 percent or more color at harvest decreased markedly. However, more high-N orchards produced good crops than did low-N orchards. In the 1.8- to 2.0-percent N range, there appeared to be fair chances for both good production and good color. In the case of McIntosh nursery trees grown in the greenhouse and supplied with different concentrations of K, it was noted that trees having sufficient K with no marked luxury consumption had about 1.7 percent of leaf K. In one instance, leaves had 4.5 percent of their dry weight as K without showing any injury. K deficiency symptoms were evident on trees receiving less than 50 p. p. m. of K. Prune trees required more K than did apple trees for vigorous growth, with the peach and cherry apparently intermediate. Since leaf analyses reflect the actual capacity of the tree to accumulate K, the author believes them to be a more reliable index to the K situation than soil analyses.

The effects of spray applications and heavy soil applications of borax on apple trees and fruits, L. P. LATIMER. (Univ. N. H.). (*N. H. Hort. Soc. Jour., 6 (1942), No. 1, pp. 66-79*).—Internal cork, a physiological disease, was found more or less prevalent in New Hampshire apple orchards, with the McIntosh unfortunately one of the susceptible varieties. Droughty conditions accentuated the tendency to injury. In the dry summer of 1941 trees were sprayed in the first part of July with a solution of 2 lb. of borax to 100 gal. of water, an amount equivalent to about 0.25 lb. of borax per tree. With the exception of one tree, no corky fruit was found, while on certain unsprayed control trees the fruit was severely affected.

In another experiment Golden Delicious trees were supplied in June 1940 through the soil with borax at rates of 0.5, 1, 2.5, 5, 10, and 20 lb. per tree. No visible injury to fruit or tree was observed that season. In 1941 without further applications severe injury was observed in the 10- and 20-lb. trees and occasional injury in the 5-lb. group. Analyses of soil collected in November 1941 beneath the trees gave evidence that much of the borax applied in the heavier treatments had either become unavailable or had leached. There was an increase in boron content in the fruit up to the maximum amounts applied. In general, Golden

Delicious apples contained more boron at any given rate of application than did Red Delicious. In the case of boron sprays there was some evidence that it is safer to spray after the leaves have attained maturity.

Lime sulphur vs. mild sulphur, A. F. YEAGER and C. R. CROSS. (Univ. N. H.). (*N. H. Hort. Soc. Jour.*, 6 (1942), No. 1, pp. 62-65).—Over a period of 7 yr. Northern Spy trees which had been sprayed continuously with flotation sulfur averaged 503 lb. of fruit per year as compared with 352 lb. for comparable trees sprayed with lime-sulfur. Data on McIntosh trees showed 314 lb. for the flotation sulfur group and 269.8 lb. for the lime-sulfur group. Results in favor of milder forms of sulfur were also obtained in a commercial McIntosh orchard. Here the individual fruits in the mild sulfur block were actually smaller than those in the lime-sulfur block, suggesting that factors other than fruit size are concerned with yield differences.

The compatibility of fruit drop chemicals, K. J. KADOW and S. L. HOPPER-STEAD. (Univ. Del. et al.). (*Peninsula Hort. Soc. [Del.] Trans.*, 55 (1941), pp. 32-34).— α -Naphthaleneacetic acid was found compatible with Black Leaf 155, Genecide, phenothiazine, and derris. Observations in commercial orchards indicated the possibility of using the sodium salt of α -naphthaleneacetic acid or α -naphthaleneacetic acid and amide in combination with Black Leaf 155. There was no evidence that the addition of the materials designed to reduce fruit dropping had any detrimental effect on the insecticidal values of the materials used. On the other hand, sprays containing lime reduced markedly the effectiveness of the fruit drop chemicals. Weathered deposits of lead arsenate, copper sulfate, and lime did not affect the effectiveness of fruit drop sprays.

Blossom sprays to take apples off and harvest sprays to hold them on, M. B. HOFFMAN. (Cornell Univ.) (*N. Y. State Hort. Soc. Proc.*, 87 (1942), pp. 172-179).—Attempts in 1940 to limit the fruit set of Wealthy trees by spraying the blooms with solutions of Elgetol showed that the condition of the tree was an important factor in the results. With neglected weak trees one application of 0.1-percent solution reduced the set about one-half, while with very vigorous trees one application when one-half of the flowers were open had little effect. In 1941 on 17-year-old very vigorous and heavily budded Wealthy trees those sprayed with 0.2-percent Elgetol when in full bloom produced almost as large apples as did hand-thinned trees. The spray did not thin the fruits as uniformly as did hand thinning, but a little supplemental thinning would have accomplished this objective.

In the case of naphthaleneacetic acid sprays applied to vigorous 16-year-old McIntosh trees to prevent preharvest dropping, the trees sprayed on September 1 dropped 7.8 percent of their fruits in the next 8 days as compared with 22.9 for the control trees. A second spray applied September 5 reduced the drop to 5.3 percent. Under the warm weather conditions of 1941 the spray gave good results with Baldwin and Northern Spy as well as with McIntosh.

A useful abnormality of the pollen in a pear, P. T. THOMAS (*Nature [London]*, 149 (1942), No. 3771, pp. 168-169).—In crosses in which the Beurré Bedford pear was used as the pollen parent, very few good seeds were obtained. A study of the pollen showed that, following normal meiosis, cell walls failed to develop between the four haploid nuclei, with the result that the pollen mother cells were transformed into giant four-nuclear pollen grains. Five types of mature grains were observed, all of which germinated readily and with more vigor than pollen from normal varieties. In crosses with diploid and tetraploid varieties, Beurré Bedford gave rise to various types of polyploids and should serve as a means of synthesizing a wide range of new polyploid pears.

Refrigerated gas storage of fruit.—V, Conference, Doyenné du Comice, and Williams' Bon Chrétien pears, F. KIDD and C. WEST (*Jour. Pomol. and Hort. Sci.*, 19 (1942), No. 3-4, pp. 243-276, pls. 5, figs. 4).—Detailed experiments were conducted with pears held under various conditions with respect to concentrations of CO₂ and O₂ and temperature. In general, it was established that a very considerable extension of storage life may be obtained by the use of atmospheres containing lower percentages of O₂ (2.5-10 percent) and higher percentages of CO₂ (5-10 percent) than are normally present in air. Temperatures as low as 31.5° F. were safely used with pears, this fruit being apparently more tolerant to low temperature than are most varieties of apples. Pears should not be wrapped in oiled papers. Upon removal from storage pears ripened at moderate temperatures attained higher quality than those ripened at lower or higher degrees. Pears picked prematurely failed to develop optimum dessert quality.

Concentration of growth hormone and fruitfulness in the Montmorency cherry, F. G. GUSTAFSON (*Natl. Acad. Sci. Proc.*, 28 (1942), No. 4, pp. 131-133).—Blossom buds that were about to open or were in the process of opening were collected from Montmorency cherry trees selected and grown by the Michigan Experiment Station for their high- and low-bearing tendencies. The buds of the fruitful trees had a growth hormone content more than three times as large as that of buds of the barren trees. Apparently there was a positive correlation between fruit setting and the growth hormone content of the ovaries of the flowers.

Strawberry production in southeastern Iowa as influenced by varieties, fertilizers, and cultural practices, P. MINGES, T. J. MANEY, and B. S. PICKERT (*Iowa Sta. Res. Bul.* 295 (1942), pp. 505-564, figs. 5).—Of 45 standard varieties and a number of seedlings tested for adaptation to southeastern Iowa, Blake-more and Howard 17 proved to be the most satisfactory kinds for commercial use. For home plantings Beaver and Narcissa were found desirable for early maturity, and Catskill, Dorsett, and Dunlap for midseason. In general the early-maturing varieties were the better producers, with evidence that strawberry varieties are rather sensitive to local environmental conditions. Among fertilizing materials, stable manure alone increased yields consistently. In one season phosphorus applications increased size and also yields to some extent. The modified matted-row type of culture was apparently the most advisable system of planting. In soil management studies need was found for proper drainage and cultivation, rotations with legumes, maintenance of organic matter, correction of soil acidity, and the use of phosphate fertilizers. Renovation of beds by mowing and burning caused serious damage in years of drought, and such measures are not advised except when sufficient rain has fallen to insure prompt resumption of growth. Much trouble from weeds could be avoided if the wheat straw used for mulching was spread during the summer in long piles away from the strawberry patch. In this process much of the weed and grain seed was shaken out of the straw.

The uneven ripening of Concord grapes: Chemical and physiological studies, J. E. WEBSTER and F. B. CROSS (*Oklahoma Sta. Tech. Bul.* 13 (1942), pp. 48, figs. 12).—Failure of all the berries in clusters of the Concord grape to color was found a serious handicap to the culture of this variety in Oklahoma. This bulletin summarizes the results of numerous experiments designed to determine the underlying causes of failure and to find treatments that would improve the situation. Unfortunately no successful treatment was revealed. The use of N fertilizer slightly improved color development, while shading and irrigation at the approach of normal maturity proved harmful. Results of

analyses showed rather conclusively that uneven coloring is associated with a partial lack of sugar in the berries that fail to color properly. Color developed satisfactorily only when the total sugar content exceeded about 7 percent. Girdling, while slightly increasing the amount of sugar in the juice, did not give increases commensurate with the labor and difficulties involved. Unlimited leaf area gave slightly better coloring than did 10 leaves per cluster. Minerals in the seeds of colored and green berries did not vary greatly, and no correlation could be established between seed content and color development. The results suggest that in areas where uneven coloring occurs, it is desirable to replace the Concord with other varieties which do color satisfactorily.

Substitutes for Concord grapes in Oklahoma, F. B. CROSS and J. E. WEBSTER (*Oklahoma Sta. Cir.* 103 (1942), [pp. 6]).—Uneven ripening, a condition that is directly associated with low sugar content, renders the Concord grape variety of doubtful value in Oklahoma. No cultural practice was found which would improve the situation, hence the station recommends a number of other varieties that could be profitably used to replace the Concord. Methods of grafting Concord and other undesirable varieties to better kinds are suggested.

Root distribution of young avocado trees on bench terraces, M. DONNELLY. (Univ. Calif. and U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 101-109, fig. 1).—Near San Juan Capistrano, Calif., four types of bench terraces, (1) preconstructed, (2) level basin, (3) Reddick, and (4) Javanese, were used for the growing of avocados under essentially dry-land conditions. The maximum root penetration was on a Reddick terrace on a southerly exposure. The maximum lateral spread was observed in Ambrose silty clay loam on a level-basin terrace on a northerly exposure. The heavier soils caused a reduction in number and an increase in size of roots. In poorly aerated compact soil zones, even with soil moisture and other conditions favorable, there were few or no roots. Root growth on the heavy soils on south exposures on preformed terraces was extremely poor and only fair on north exposures on preformed terraces of Ambrose silty clay. Roots grew well in Ambrose clay on the Javanese bench with northerly exposures. On southerly Reddick bench terraces root growth was fair to good in Ambrose clay and excellent in Altamont silt loam. On the level-basin terraces root growth was excellent.

Moisture studies under citrus using tensiometers, L. A. RICHARDS and M. R. HUBERTY. (U. S. D. A. and Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 73-79, figs. 4).—Records were taken over 1 yr. on soil moisture tensiometers placed at eight depths down to 15 ft. under two 11-year-old navel oranges budded on sweet orange, with one tree irrigated twice as often as the other. Plants grew and extracted water from soils over a tension range from 0 to about 15 or 16 atmospheres at the wilting point. The range for tensiometers was, however, from 0 to somewhat less than 1 atmosphere. Under the lightly irrigated tree all tensiometers at depths of 4 ft. or more stayed on scale all year. Under the tree with heavy irrigation, all tensiometers of 3 ft. or more stayed on scale all summer. The data provided information on the rate and depth of moisture penetration, on moisture storage and on the rate of root extraction at various depths, and on root zone leaching.

Measurements on hydrocyanic acid absorbed by citrus tissues during fumigation, E. T. BARTHELOMEW, W. B. SINCLAIR, and D. L. LINDGREN. (Calif. Citrus Expt. Sta.). (*Hilgardia [California Sta.]*, 14 (1942), No. 7, pp. 373-409, figs. 9).—Based on fumigation experiments with Valencia orange leaves and fruits in a gastight metal fumatorium and in regulation canvas tents in the orchard, information is presented on some of the factors influencing the absorption and retention of HCN by citrus tissues. The concentrations of gas

remained nearly constant in the fumatorium but varied greatly in the tents in the orchard. Considerably more HCN was absorbed by fruits preconditioned overnight at 43° F. before fumigation than by those held at 80°. Green fruits absorbed an average of 5.4 times as much HCN as did mature fruits. Under laboratory conditions the absorption of HCN was retarded by the oil spray, but this did not occur in the orchard. In the laboratory none of the fruits was injured by HCN, while in the orchard about 6 percent of the oil-sprayed trees were damaged. That irrigation may affect absorption of HCN was shown in a greater gas absorption by leaves and fruits of trees that had been recently irrigated than by those which had not been irrigated for sometime. Fruits sprayed with water and a spreader and fumigated at once absorbed less gas than did dry fruits. In comparable trials with inland- and coastal-grown green oranges the coastal fruits were more severely injured despite the fact that in one case the inland fruits absorbed more HCN. Green fruits fixed or chemically changed absorbed HCN so that it could not be recovered and determined by the usual methods. Despite the fact that leaves and fruits absorbed approximately the same amounts of HCN whether fumigated during the day or night, more injury followed day treatments. Greater day injury appeared to result from the effect of sunlight in raising temperature and influencing the physiological condition of the tissues. In the experiments recovered HCN was retained by mature leaves for at least 60 hr., by green fruit for 35-40 hr., and by mature fruit for 20-25 hr. The stomata were apparently not important in governing the rate of entrance of HCN into citrus leaves and fruits.

Rebuilding cold-injured lemon trees, F. F. HALMA. (Univ. Calif.). (*Calif. Citrog.*, 27 (1942), No. 8, pp. 220, 233, figs. 2) —Severely injured 5-year-old Eureka lemon trees were successfully restored, and 5 yr. after the operation were yielding as well as, if not slightly better than, replants made shortly after the freeze. The cost of rebuilding the trees was less than that of replanting them. In the case of trees so badly injured that the entire lemon trunk had to be removed, requiring the rebudding of a rootstock sprout, the results were of dubious value both from the standpoint of expense and recovery.

The native persimmon, W. F. FLETCHER, revised by H. P. GOULD (*U. S. Dept. Agr., Farmers' Bul.* 685, rev. (1942), pp. [2]+22, figs. 17).—This is a revision of the edition of 1915 (E. S. R., 34, p. 43). General information is offered on the distribution of the persimmon, growth and fruiting habits, methods of propagation, planting, pruning, cultural care, control of diseases and insect pests, use of the tree in erosion control, utilization of the fruits (including recipes), etc.

Care of top-worked pecan trees, C. H. RAGLAND (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 6, p. 7, figs. 3).—The removal of competing sucker shoot growths and the provision of support for rapidly growing scions are recommended and procedures discussed.

Delayed foliation of pecan trees in Arizona, C. W. VAN HORN. (Ariz. Expt. Sta. and U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 87-94, figs. 2).—Records taken in the Yuma, Salt River, and Safford Valleys showed the most uneven breaking of buds or delayed foliation in areas with the warmer winter periods. Delayed foliation was practically always shown by the opening of the buds on the northeast side of trees several days before those on the southwest side. Greater absorption of heat by the buds on the southwest side of the trees is believed to account, in part, for this difference. In 1940-41 the percentage of possible sunshine at Yuma was somewhat below the average, and symptoms of delayed foliation were much less pronounced than usual. A dormant DNO spray (2-4-dinitro-6-cyclohexylphenol in oil) was found rather effective in stimulating initiation of growth within certain

pecan varieties at Yuma. At Safford, where there was apparently ample natural chilling, the DNO treatment had no stimulating effect. Varieties differed somewhat in their response to DNO treatments, due apparently to their different chilling requirements. Shoot growth, size of leaves, percentage of shoots forming pistillate blossoms, percentage of blossoms to set nuts, and yield of nuts were other measures of response to different conditions.

Some aspects of dichogamy and pollination in pistache, W. E. WHITHOUSE and C. L. STONE. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 95-100, figs. 2).—An analysis of blooming records taken at Chico, Calif., over 4 yr. indicated that more than one male is probably needed for the effective pollination of a given female variety. The mere overlapping of blossoming periods was not adequate to insure a set of fruit because all the pistillate flowers are not receptive during the entire blooming period. Under favorable conditions for pollination no important differences were noted in the set obtained with different pollens whether the pollens was intraspecific or interspecific. The primary consideration appeared to be the provision of abundant pollen at the proper time.

Rubber from western desert plants (*Farm and Home Sci. [Utah Sta.]*, 3 (1942), No. 2, pp. 2, 11).—Comments are presented upon the rubber situation and the possibility of utilizing various rubber-producing native plants, including rabbitbrush and milkweeds.

Hedge plants for the northern Great Plains, T. K. KILLAND (U. S. Dept. Agr., *Farmers' Bul.* 1898 (1942), pp. 11-13, figs. 11).—In connection with information on the use of hedges, planting materials, handling and planting, pruning, and care the results of extensive tests with different plants conducted at Mandan, N. Dak., are discussed. Green ash, boxelder, and Siberian elm were found best for high screens or shelters. For medium-high general-purpose hedges common buckthorn, Siberian pea-tree, Russian-olive, and Chinese lilac were found desirable, but buckthorn could not be recommended because it is a host for crown rust of oats. Peking cotoneaster, *Ribes diacanthum*, and flowering plum are recommended for dwarf to medium-high hedges. Vanhoutte spirea, *Spiraea bumalda* var. *rosea*, and Japanese barberry were promising for untrimmed hedges, but all suffered during protracted droughts.

The distribution of North American rose species, T. M. LITTLE. (U. S. D. A.). (*Amer. Rose Ann.*, 1942, pp. 37-49, figs. 9).—With the aid of maps, information is presented on the distribution of native rose species in North America.

Trenching and soil-mixtures: Their effect on rose-production, E. I. WILDE and R. P. MEAHL. (Pa. Expt. Sta.). (*Amer. Rose Ann.*, 1942, pp. 95-98).—In experiments with Grenoble roses grown in eight different soil mixtures, the best growth was recorded in soils to which manure had been added. The most luxuriant growth, the longest stems, and the greatest number of blooms were produced by plants growing in one-half loam, one-fourth manure, and one-fourth hyperhumus. The average production of flowers over a 3-year period increased as the depth of trenching was increased up to the 24 in. used. However, loss by winter injury in most cases increased with depth of trenching and with other conditions that favored luxuriant growth.

FORESTRY

[Forestry studies by the Indiana Station] (*Indiana Sta. Rpt.* 1941, pp. 73-74, 74-76).—Reports are presented on the following studies: Marketing Indiana woodland products, by R. C. Brundage; tree volume tables for Indiana, by A. M. Herrick; and wood lot management, management of the experimental

nursery, and air movement as affected by windbreaks, all by D. DenUyl.

Effect of planting methods on survival and growth of plantations on well-drained sandy soils of central Wisconsin, S. A. WILDE and A. R. ALBERT. (Wis. Expt. Sta. et al.). (*Jour. Forestry*, 40 (1942), No. 7, pp. 560-562, fig. 1).—A number of planting methods were investigated on an exposed area of a depleted outwash sandy soil in central Wisconsin. Jack and red pine seedlings were planted in shallow and deep furrows, on top of the furrow slice, in slits without scalping, and in holes using a spade and supplying additional humus soil. Planting in deep furrows gave the best and slit planting the poorest results, both in survival and in rate of growth. The direction of the furrow exerted no significant effect.

Fertilizer trials for improved establishment of shortleaf pine, white ash, and yellowpoplar plantings on adverse sites, W. H. CUMMINGS (*Jour. Forestry*, 39 (1941), No. 11, pp. 942-946).—On test plantings of shortleaf pine, white ash, and yellow poplar seedlings made on acid soils of low fertility in southern Ohio, fertilizers did not notably stimulate height growth in any of the three species, although in some instances each of the species responded to fertilizer. The results suggested the need for further tests in which shortleaf pine would be treated with fertilizers low in N, high in P_2O_5 , and very low in K, with supplements of acid peat. White ash should be tested further with fertilizers high in N, low in P_2O_5 , and very low in K, with supplements of acid peat. Yellow poplar appeared to need materials with medium N; very low in P_2O_5 , and low in K, with dolomite limestone filler.

Producing seedlings of eastern red cedar (*Juniperus virginiana* L.), M. AFANASIEV and M. CRESS (*Oklahoma Sta. Bul.* 256 (1942), pp. 21, figs. 5).—The cause of delayed germination in the seed of the eastern red cedar was found to be a dormant embryo. Stratification at a low temperature was required to complete afterripening, but the time needed varied with different lots of seed. The drying of afterripened seed reduced germination and induced a period of secondary dormancy. However, a shorter duration of stratification was needed to overcome the secondary dormancy. Freezing of afterripened seed for 4 weeks lowered germination only to a small extent. The optimum temperature for germination of afterripened seed was 50° F., and 60° and 70° almost as good. Above 70° the rate of germination was retarded markedly. A temperature of 100° was almost prohibitive to germination and growth of the resulting seedlings. Within the pH range of 4.4 to 8.4, germination occurred about equally well. Cleaned seed was held at 41° for 1 yr. without loss of viability, and dry berries were held at room temperature for a similar period without reducing germination. Holding afterripened seeds in pure oxygen for 24 hr. lowered their viability.

The Johnson fir, O. V. MATTHEWS (*Jour. Forestry*, 40 (1942), No. 7, pp. 579-581, figs. 3).—A description is presented of a variant form of *Abies grandis*, here designated as *A. grandis* Lindl. f. *Johnsoni*, forma nova.

Growing of white pine on the Yale forest near Keene, New Hampshire, R. C. HAWLEY and R. T. CLAPP (*Yale Univ. School Forestry Bul.* 48 (1942), pp. [4]+44, pls. 10, fig. 1).—A descriptive account is given of the Yale Forest, an area used as a field laboratory for scientific research and a demonstration of effective forestry practices. White pine is the principal tree grown on the forest because of its high value and its natural adaptation to the soil and climate. The hurricane of 1938 destroyed virtually all the timber over 40 yr. of age.

Information is given on methods of harvesting merchantable wood and timber, of establishing new stands, and upon cultural operations, such as pruning, thinning, and insect control, required in the development of a profitable crop.

A forty-year old planted longleaf stand, C. R. Ross (*Jour. Forestry*, 40 (1942), No. 7, pp. 581-584, fig. 1).—Measurements are presented on a small plantation (1.15 acres) of longleaf pine established 40 yr. ago on a very light sandy soil in Lee County, S. C. Despite the fact that the soil was poor and that the needles had been annually raked from the area, the trees had made a very reasonable growth.

The naturalization of Scotch pine, northeastern Oneida County, N. Y., H. H. YORK and E. W. LITTLEFIELD (*Jour. Forestry*, 40 (1942), No. 7, pp. 552-559, figs. 3).—Plantations established in the northeastern part of Oneida County, N. Y., between 1870 and 1888 were found to be reproducing abundantly and the species to be spreading gradually. The sandy soil of the area was apparently well suited to Scotch pine, and the abandoned farm lands favored its establishment.

***Pinus thunbergii*: A successful exotic on the North Atlantic coast, E. W. LITTLEFIELD** (*Jour. Forestry*, 40 (1942), No. 7, pp. 566-573, figs. 3).—Information is presented on the introduction and present distribution of the Japanese black pine, now recognized as a very valuable tree for coastal forestation and landscape use. In hardness it compares favorably with other pines, having endured temperatures as low as -20° F. in western New York during the cold winter of 1933-34. The seedlings are, however, rather sensitive to low temperatures and require mulching. This pine is notable for its saline tolerance and resistance to European pine shoot moth and other insects. The species has limited forestry value and may find its maximum use as a protective tree and for park and landscape purposes.

Effects of certain soil treatments on the development of loblolly pine nursery stock, L. K. ANDREWS (*Jour. Forestry*, 39 (1941), No. 11, pp. 918-921).—In experiments conducted in a forest tree nursery in the sand-hill region near Hoffman, N. C., a significant benefit in the growth of loblolly pine seedlings was obtained from the addition of a heavier textured soil or of organic matter. Root: shoot ratio by weight was reduced as a result of such treatments, but the root system had a larger number of small branching rootlets. The most desirable planting stock was obtained when both organic material and a concentrated fertilizer containing a high percentage of phosphoric acid was added to sandy soil.

Effect of stocking and seed on nursery development of eastern white pine seedlings, L. H. REINEKE (U. S. D. A.). (*Jour. Forestry*, 40 (1942), No. 7, pp. 577-578).—Observations on eastern white pine seedlings grown from two lots of seed, one of unusually large seed and one approximately average, indicated that the density of the stand in the seedbed has a material effect on the development of the plants. Seed size influenced the magnitude of the modifications due to density. The value of reduced density was shown in the increased sturdiness of the seedlings as reflected in larger stems and taproot diameters and more numerous and longer lateral roots. The time required to grow stock to a desired size may be reduced by decreasing the seedbed density.

Polyembryony in seeds of southern pines, M. L. NELSON (*Jour. Forestry*, 39 (1941), No. 11, pp. 959-960).—During germination tests with southern pine seeds conducted in 1936-37 several instances were found in which there was more than one embryo present, especially in *Pinus palustris*. Polyembryony was most often characterized by two seedlings, one large and one rather small and usually imperfectly developed. Occasionally the two seedlings were of equal size. To a lesser extent polyembryony was observed in seeds of *P. caribaea* and *P. echinata*.

The necessity of zinc for *Pinus radiata*, M. E. SMITH and N. S. BAYLISS (*Plant Physiol.*, 17 (1942), No. 2, pp. 303-310, figs. 3).—Plants produced from seeds collected from a tree growing in a locality where rosetting is known to be of frequent occurrence were grown in a zinc-free culture solution. There was no mycorrhiza present. Deficiency symptoms were observed within 3 to 4 mo. These symptoms were slow growth; inwardly folded apical needles, which later exhibited a yellow mottling, followed by bronzing; and short, stiff dark-green secondary needles in unopened fascicles. The root tips may be distinctly swollen.

Strength properties of Chinese elm, A. J. PANSHIN. (Mich. State Col.). (*Jour. Forestry*, 40 (1942), No. 7, pp. 564-565, fig. 1).—On the basis of strength properties, rapidly grown Chinese elm wood was found equal to both American and slippery elm wood except in static bending where the Chinese elm was noticeably inferior to the native American species in stiffness. Information is presented on the anatomical features of Chinese elm wood.

Comparison of logging costs with clear-cutting and several intensities of selective thinning in northern Minnesota jack pine, C. B. SCOTT. (U. S. D. A.). (*Jour. Forestry*, 40 (1942), No. 7, pp. 544-551, figs. 5).—The results of a detailed study of the costs involved in the clear-cutting and partial cutting of jack pines are discussed.

Filters for penetrating atmospheric haze, G. M. BYRAM. (U. S. D. A.). (*Jour. Forestry*, 40 (1942), No. 7, pp. 530-532, figs. 5).—A polarizing screen or combination screen and red filter was found to penetrate haze to a much greater degree than any kind of color filter used alone. The underlying principles, the construction, and the operation of the apparatus are discussed.

DISEASES OF PLANTS

[Plant disease work by the Idaho Station] (*Idaho Sta. Bul.* 244 (1942), pp. 18, 39-42, 47-49, 50).—Notes are presented, by H. K. Schultz, K. H. W. Klages, J. M. Raeder, H. C. Kirkpatrick, W. J. Virgin, D. Murphy, E. C. Blodgett, J. E. Kraus, and J. L. Toevs, on the influence of diseases on growth and yield of wheat, barley, and oats, including tests of varieties, crosses, and selections; prevention of the spread of bacterial ring rot of potatoes on the cutting knife and description of early plant symptoms of infection; tests of potato seedlings for virus resistance; decay in cut potato seed pieces exposed to hot dry conditions; extensive occurrence of *Fusarium* wilt of potatoes; effect of moisture supply on jelly end rot of potatoes; resistant crosses and selections of beans (coop. U. S. D. A.); bacteria causing poor germination of pea seed; tomato hybrid showing promise for curly top resistance; low storage temperatures preventing carrot rots; virus-induced western X disease and wart disease of peach trees; arsenic toxicity to peach trees; fire blight of pear; and bacterial gummosis of sweet cherry and apricot.

[Plant disease studies by the Indiana Station] (*Indiana Sta. Rpt.* 1941, pp. 48-49, 49-50, 51-53, 85, fig. 1).—Brief reports of progress are included on studies of a new disease of peppermint in Indiana shown to be caused by *Verticillium* sp., by R. C. Baines; eradicator sprays for apple scab, by Baines and C. L. Burkholder; control of peppermint anthracnose by clean plowing, by Baines and R. H. Wileman; the taxonomy of the plant rust fungi, by G. B. Cummins; types of potato scab and their control in Indiana muck soils, by R. W. Samson; and *Fusarium* wilt of China aster, by E. R. Honeywell.

[Phytopathological studies by the Puerto Rico Station] (*Puerto Rico Sta. Rpt.* 1940, pp. 5-11, 53, figs. 3).—Progress reports are given on studies by A. G. Kevorkian and E. Hernandez Medina of *Fusarium datatatis vanillae* root rot as a limiting factor in vanilla production in Puerto Rico, including data on two districts where no commercial losses from it have occurred, a blast disease due to

an undetermined fungus, and the limited capacity of hold-fast roots of vanilla to utilize nutrients; and by Kevorkian on the susceptibility of the sugarcane variety Mayaguez 338 to the *Fusarium* of pokkah boeng disease.

Diseases of plants reported in Texas since 1933, G. E. ALTSTATT. (Coop. Tex. Expt. Sta.). (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1942, Sup. 135, pp. 37-50*).—This check list involves those plant diseases found since the publication of the previous list by Taubenhaus and Ezekiel (*E. S. R.*, 70, p. 486), including new host plants subject to *Phymatotrichum* root rot reported subsequently to the list, by the same authors, previously noted (*E. S. R.*, 76, p. 642). The arrangement is alphabetical by Latin names of hosts, in each case followed by common name of disease and cause.

The Plant Disease Reporter, [June 1 and 15, July 1-15, 1942] (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 26 (1942), Nos. 10, pp. 227-244; 11, pp. 245-275, figs. 3; 12-13, pp. 277-304, figs. 2*).—The following are included:

No. 10.—An annotated list of the parasitic fungi (28 genera, including at least 73 recognized species and varieties and a total of 191 host-pathogen combinations) on cereals and other grasses in Klickitat County, Washington, by R. Sprague; the cereal disease situation in Kansas, by C. O. Johnston; early leaf rust development in eastern Nebraska in 1942, by M. W. Felton; strawberry spring dwarf situation on Cape Cod, by O. C. Boyd; and brief notes on the increase of potato virus diseases in New Hampshire last year, tobacco seedbed diseases in Maryland, wet weather and plant diseases in New Hampshire this spring, and apple scab in Maryland.

No. 11.—A disease of wheat newly recorded for this country—yellow spot disease (*Helminthosporium tritici-vulgatis*) of wheat in New York State, by M. F. Barrus; *Helminthosporium tritici-vulgatis* on wheat in Maryland, by A. G. Johnson; notes on diseases, decays, and disorders of tobacco in Puerto Rico during the 1941-42 season, by H. H. Foster, M. Garcia Fortuño, and G. Irizarry Rubio; additions to the host index of fungi of Mount Shasta, California, II, by W. B. Cooke (*E. S. R.*, 84, p. 60); brief notes on control of silvertop of fescue by burning, wheat leaf rust in South Dakota, a wood-destroying fungus (*Stereum rugosusculum*) on sweet gum, tupelo, and black gum, rust (*Uredo sapotae*) on sapodilla in Florida, and various plant diseases observed in Pennsylvania; and host-parasite check-list revision (*Rosmarinus* to *Rubus*), by F. Weiss.

No. 12-13.—Tomato tip blight (caused by a strain of the spotted wilt virus) found in West Virginia, by J. G. Leach and A. Berg; tomato tip blight (distributional data meager, and it is suggested that pathologists be on the lookout for it); two *Cercosporas* (*Cercospora papaveri* and *C. atropae*) newly reported in the United States; peony anthracnose found in Illinois, by D. B. Creager and G. H. Boewe; dieback (*Gloeosporium?*) of safflower in Texas, by H. Rich; tests with two varieties of roses for resistance to black spot, by E. W. Lyle and G. E. Altstatt; Spergon for sweetpotato treatment—limited test in Arkansas, by V. H. Young; a tobacco seedbed disease survey in Massachusetts, 1942, by W. H. Davis; reports on late blight of potato on Long Island and in Pennsylvania and Wisconsin, and on losses caused by potato diseases in the Hastings Section, Florida, in 1942; reports on diseases of small grains in Pennsylvania, South Carolina, Texas, Kansas, central and southern California, and Arizona, and cereal rusts in southwestern Virginia, West Virginia, and South Dakota; reports on diseases of fruit crops, including red stele of strawberry on Pathfinder and Aberdeen varieties, apple scab in Rhode Island, and fruit diseases in New York and Pennsylvania; brief notes on weed control by plant diseases in Kansas, diseases of vegetables and ornamentals in Pennsylvania, bacterial wilt and smut on sweet corn, flax

diseases in southeastern Kansas, and leaf spots on bluegrass and alfalfa in Pennsylvania; and host-parasite check-list revision (*Sabal* to *Salix*), by F. Weiss.

Index to Supplements 130-132, N. W. NANCE (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1941, Sup. 133, pp. 105-126*).

A polysaccharide produced by the crown-gall organism, F. C. MCINTIRE, W. H. PETERSON, and A. J. RIKER. (*Wis. Expt. Sta. et al.*). (*Jour. Biol. Chem., 143 (1942), No. 2, pp. 491-496*).—"The isolation and characterization of a polysaccharide produced by the crown-gall organism are presented. The polysaccharide appeared to be homogeneous as judged by analysis of diffusion data and by constant rotation through reprecipitation and fractionation of both the original material ($[\alpha]_D^{25} = -9^\circ$ to -10° , in water, $c=2$) and its acetylated product ($[\alpha]_D^{25} = +56^\circ$ to $+58.5^\circ$, in chloroform, $c=1$). Hydrolysis of the polysaccharide gave only *d*(+)-glucose as indicated by specific rotation, iodometric titration, and yield of glucobenzimidazole. A shift in rotation during hydrolysis indicated a predominance of β linkages, while the rate of hydrolysis and the shape of the hydrolysis curve suggested that the inner ring structures were exclusively pyranoside. The molecular weight calculated from sedimentation velocity and diffusion constants was $3,600 \pm 200$, which corresponds to about 22 anhydroglucose units per molecule."

Fungicidal properties of 2,4-diaminodiphenylamine and other substituted diphenylamines, M. C. GOLDSWORTHY, E. L. GREEN, and H. L. HALLER. (*U. S. D. A.*). (*Jour. Agr. Res. [U. S.], 64 (1942), No. 11, pp. 667-678*).—In laboratory tests 2,4-diaminodiphenylamine was found to be fungicidal against *Sclerotinia fructicola* and *Glomerella cingulata*. Small scale orchard tests also indicated this material to be of some value for control of apple scab and peach scab but not of cherry leaf spot. As an orchard spray, its principal deficiency lies in its high solubility in water, which affects its lasting qualities. The material did not injure apple, pear, quince, plum, apricot, cherry, peach, or bean under field or greenhouse conditions. Of a group of closely related diphenylamines tested in the laboratory only, 2,4-diamino-2-phenyldiphenylamine, diphenylamine, 4-nitrodiphenylamine, 4-chlorodiphenylamine, and diphenylparaphenylene were toxic to fungi in various degrees, but none approached that of 2,4-diaminodiphenylamine. Except for the first two, none of the compounds tested were injurious to Red Kidney bean.

An outline for the treatment of vegetable and field crop seeds, J. A. PINCKARD (*Miss. Farm Res. [Mississippi Sta.], 5 (1942), No. 6, pp. 3-4, 6*).—This contribution describes methods and materials which have proved valuable to others in their attempts to prevent losses among seedling plants. Following general directions for seed treatments, the specific data are taken up alphabetically under particular fungicides and tabulated under host plants and their diseases.

Influence of cultural factors on alfalfa seedling infection by *Pythium debaryanum* Hesse, W. F. BUCHHOLTZ (*Iowa Sta. Res. Bul. 296 (1942), pp. 569-592, figs. 3*).—*P. debaryanum* was found to cause rapid direct or indirect necrosis of germinating alfalfa seed or seedlings and to retard development by primary and secondary root girdling and root tip necrosis, resulting in partial or occasionally complete losses of seedling stands and in dwarfed plants with root systems inadequate to carry the plants through high-temperature and low-soil-moisture periods. Seedling infection tended to be more prevalent in acid than in neutral Iowa soils. Lime proved ineffective for control in laboratory tests but gave small though sometimes inconsistent increases in stands on acid soils in certain field plots. Seed treatment with ethyl mercury phosphate was effective in the laboratory and in some field plantings in 1935, but in subsequent field tests

it was not. Early plantings usually yielded better stands than later spring plantings. Deep plowing was effective for control in 1935, but less markedly so in 1937 and 1938. The fungus appeared to be more abundant in the surface soil than below 4 in. in depth, and deep plowing turned up the relatively uninfested soil for the seedbed. Red clover, alsike clover, and white Dutch clover appeared more resistant than alfalfa in greenhouse plantings in infested soil, and the first two yielded much better stands than alfalfa in unplowed fallow infested soil in single-plat field plantings in 1935. Sweetclover stands in the same plantings were also better than the alfalfa stands. The general indications from this study are that it may be possible to improve alfalfa seedling stands by planting early, to a limited extent by liming acid soil, and by deep plowing to expose uninfested soil for the seedbed.

The factorial interpretation of anthracnose resistance in beans, C. F. ANDUS and B. L. WADE (U. S. Dept. Agr., Tech. Bul. 810 (1942), pp. 29, figs. 6).—The inheritance of resistance to three physiologic forms of *Colletotrichum lindemuthianum* (β , γ , and δ) was studied in intervarietal bean crosses, 15 parent varieties and selections being used in 80 combinations. Field and greenhouse inoculations were made on 145 first-, about 32,600 second-, 108,000 third-, and a considerable number of fourth-generation plants. In crosses of resistant \times tolerant and resistant \times susceptible, resistance was always dominant. In two crosses of tolerant \times susceptible, susceptibility was dominant in the F_1 and subsequent generations. A few resistant \times resistant crosses segregated a proportion of susceptible, and certain susceptible \times susceptible crosses segregated a proportion of resistant, plants. It is suggested that such crosses offer the quickest way to ascertain the existence of heterogeneity of genotypes in host species.

Monohybrid and dihybrid ratios were obtained with all three fungus forms, and trihybrid ratios also were obtained with two forms. A system of 10 genes in 3 allelomorph series, involving both duplicate and complementary genes for resistance, 1 dominant gene for susceptibility, and gene interactions at 3 points, is proposed as the simplest mendelian hypothesis coordinating all the data for β and γ anthracnose. A simpler explanation (3 independent pairs of genes) would suffice for δ , but the more complex gene system is not thereby excluded. The hypothesis calls for 11 susceptible and 25 resistant parental genotypes of which 2 susceptible and 5 resistant were apparently realized in the β data alone. In certain cases differences were noted in the proportion of susceptible segregants as between greenhouse and field, between second and third generations, and between reciprocals. It is considered that 1 gene could be responsible for all the irregularities. It could be presumed that the same genes are operating in respect to all three fungus forms, but that they exercise a modified or reversed function, depending on the form to which the host is exposed. Although the genotype of any individual is strictly speaking unchangeable, it would be necessary to express the disease reaction genotype by different symbols expressive of the host-parasite interaction. On this basis the number of genes involved in anthracnose reaction is not necessarily proportional to the number of physiologic forms of the pathogen. Linkage was observed in one cross between red seed-coat color and susceptibility to β and γ anthracnose.

Cercospora eyespot of Kentucky bluegrass, R. SPRAGUE. (Oreg. Expt. Sta. coop. U. S. D. A.). (*Phytopathology*, 32 (1942), No. 8, pp. 737-738, fig. 1).—*C. poagens* n. sp. was found to cause a distinctive straw-color to light-brown lesion with a definite yellow halo or eyespot effect on living leaves of *Poa pratensis* in Oregon.

Some pathogenic fungi occurring in the seed of red and subterranean clover, S. J. P. CHILTON. (U. S. D. A.). (*Phytopathology*, 32 (1942), No. 8,

pp. 738-739).—Subterranean clover seed (6 lots) and red clover seed (49 lots) were surface-sterilized with 1-1,000 HgCl₂ followed by a Ca-hypochlorite solution and plated on potato-dextrose agar medium. *Pleospora herbarum*, *Stemphylium sarcinaeforme*, *Ocerospora zebrina*, and a sterile black fungus of large mycelium called the "black patch" fungus by the Kentucky Station (1934) were obtained from the red clover seed. A much higher fungus incidence was found in macroscopically blemished than in sound seed. *Sclerotium bataticola*, *Rhizoctonia solani*, and *Fusarium* were isolated from one lot of subterranean clover seed.

Relative susceptibility to Pythium root rot of twelve dent corn inbreds, C. ELLIOTT. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 12, pp. 711-723, figs. 8).—The plants tested were grown in sand, watered with nutrient solution, and inoculated by adding agar cultures of *P. arrhenomanes* to the sand after the plants were well established. Weekly growth measurements of inoculated and control plants and weights of tops and roots indicated that some inbreds were susceptible to root rot, some were resistant, and others were intermediate in reaction. Inbred Ia. L317 proved most resistant and inbred C. I. 1 most susceptible. The fungus interfered to some extent with the growth of all the inbreds by destroying the fine feeding roots.

Cottonseed treatments in New Mexico, G. STATEN (*New Mexico Sta. Bul.* 290 (1942), pp. 32, figs. 7).—Tests with acid-delinted and undelinted cottonseed and the effects of various dust treatments on them are reported. Significant correlations of percentages of floating seed and of germination were found, but some types of immature seed could not be removed by cleaning. Considerable improvement in the germinability of low-quality seed by cleaning was noted, but little improvement in that of good-quality seed could be expected. Normal dosages of several commonly used dust treatments, including New Improved Ceresan, 2-percent Ceresan, and Spergon, were found to decrease the rate of germination slightly. Overdosages of the first delayed germination seriously, and toxic effects on seedlings were noted. Dust-treated seed was held under three different storage conditions for over a year without injury to germinability. New Improved Ceresan and 2-percent Ceresan gave excellent protection against seed rotting in cold soils for both delinted and undelinted seed, and Spergon was almost as good as either of these treatments. Sanosed and Cuproclde afforded some protection but were comparatively ineffective. No difference was found in the ability of acid-delinted and undelinted seed to resist rotting in cold soil. Spergon, New Improved Ceresan, and 2-percent Ceresan, in the order named, proved effective in increasing seedling emergence, preventing pre-emergence damping-off, increasing survival stands, reducing postemergence damping-off in some cases, and increasing survival stands of healthy plants in soils infested with *Rhizoctonia*. Cuproclde and Sanosed were ineffective, and none of the treatments were very satisfactory, in preventing infection after emergence of the seedlings. In field-plat trials acid-delinted seed produced slightly (not significantly) higher yields than undelinted seed. Both New Improved Ceresan and 2-percent Ceresan were effective in increasing the survival stand of plants in the field but did not significantly increase the yield of a full field stand. Use of a good dust treatment is recommended regardless of whether delinted or undelinted seed is planted. Some of the dusts are toxic to man, so care should be used to prevent inhaling or allowing them contact in quantities with the skin.

Observations on soil conditions and a foot and root-rot disease of darso during 1940, H. F. MURPHY. (*Okl. Expt. Sta.*). (*Okl. Acad. Sci. Proc.*, 21 (1941), pp. 79-80).—Field observations indicated the disease (identity not yet definitely established) to be more prevalent on areas with soil moisture

favorable to darso, and in rotation tests it was most severe on plats which had been limed. Soil reaction appeared to be another factor involved. The general results of the season's observations served to stress the complexity of this disease situation.

Preliminary investigations on mechanical injury in flax seed, J. R. MACHACEK and A. M. BROWN (*Phytopathology*, 32 (1942), No. 8, pp. 733-734).—Tests on a large number of samples indicated that in most cases the seed was severely damaged by cracking of the seed coat. This occurred during threshing, and, being almost invisible to the naked eye, did not lower the market grade. When such seed were planted they usually failed to germinate, thus causing thin stands and much lowered yields. Seed treatment with Ceresan or Half-ounce Leytosan prevented this loss.

Breeding for disease resistance in oats, H. C. MURPHY, T. R. STANTON, and F. A. COFFMAN. (Iowa Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 1, pp. 72-89, figs. 2).—The major oats diseases in the United States are said to be loose and covered smuts and crown and stem rusts, and among the minor ones occasionally causing considerable damage are blast (non-parasitic), *Fusarium* blight, halo blight, stripe blight, *Helminthosporium* leaf blotch, and *Pythium* root necrosis. Estimates reported in *The Plant Disease Reporter* (U. S. D. A.), 1919-38, showed an annual loss from smuts of about 3.5 percent (about 40 million bushels) of the oats crop of the United States. The estimated losses from rusts for this same period are 2 percent (nearly 23 million bushels) for crown rust, and 1.2 percent (about 14 million bushels) for stem rust. Recent statistical studies of the effects of crown and stem rusts on oats production indicate that these estimates may be much too low.

For the smuts, Victoria is highly resistant to all known races, Markton and Navarro are highly resistant to all but certain rare races, and Bond and Black Mesdag have adequate resistance under most field conditions. For crown rust, Bond and Victoria are highly resistant to all except certain rare and little known races. Rainbow, Alber, and Capa may be classed as only moderately resistant, but this resistance affords considerable protection to the crop in many sections. For stem rust, Richland, Iogold, and Rainbow are highly resistant to all races of apparent economic importance, showing susceptibility only to certain rare races, the old White Tartar oat has furnished adequate resistance under certain field conditions, and Jostrain (Joanette strain) can be classed only as moderately resistant.

By crossing within this group of varieties, many new strains have been developed with resistance to the smuts only, to stem rust only, to smuts and stem rust, to smuts and crown rust, and to the smuts, stem rust, and crown rust in combination with high yield and quality. In winter oats, strains combining disease resistance and winter hardiness also have been evolved. Among the new agronomic smut-resistant varieties are Carleton, Bannock, Marida, Huron, Uton, Fulgrain, and Fulton. Vanguard is the only comparatively new stem-rust-resistant variety that has been named. Certain selections from a cross of Hajira × Joanette are outstanding because of their apparent resistance to all races of stem rust. Among the recently developed smut- and stem-rust-resistant named varieties are Nakota (hull-less) and Hancock. The number, however, with resistance to smut and crown rust is much larger, and a list of 13 is given. The newly developed and named varieties resistant to the smuts, crown rust, and stem rust include Marlon, Boone, Tama, and Vicland. Combining resistance to the more important minor diseases with that already available to the smuts and rusts does not seem impossible. Definite varietal resistance has been reported for oats blast, halo blight, bacterial stripe blight, *Pythium* necrosis, etc. There are 28 references.

Alteration of potato starch grain structure under the influence of disease. D. B. O. SAVILE (*Amer. Jour. Bot.*, 29 (1942), No. 4, pp. 286-287, figs. 6).—The occurrence of malformed starch grains in potato tubers affected by various fungus, virus, or environal disorders and associated nuclear abnormalities are described. It is suggested that the formation of these grains is attributable to an altered physical state of the leucoplasts.

A stem-end rot of potato tubers caused by *Rhizoctonia solani*. F. S. THATCHER (*Phytopathology*, 32 (1942), No. 8, pp. 727-730, figs. 2).—In this "punky" stem-end tuber rot, found to be due to *R. solani*, disease development depended on the prevalence of conditions tending to retard wound-periderm formation, and low temperatures and high rainfall shortly before harvesting were field conditions favoring it. Symptoms could be duplicated by keeping inoculated tubers at 5° C. in a moist chamber or in water-saturated sand at 15°-20°. Tracheids provided the main avenue of progress through the tuber.

Further studies on the temperature relations of sclerotial isolates of *Rhizoctonia solani* from potatoes. E. L. LECLERC, L. H. PERSON, and S. B. MEADOWS. (U. S. D. A. and La. Expt. Sta.). (*Phytopathology*, 32 (1942), No. 8, pp. 731-732).—The optimum temperature for radial growth of 63 isolates from sclerotia on potato tubers was 25° C.; for 2 crown rot and 2 dry rot isolates from sugar beets it was 30°. These results confirm those previously reported (E. S. R., 85, p. 67).

[Potato scab] (*Amer. Soc. Agron., Com. Fert. Min.*, 7 (1941), pp. 4-17).—Included are replies to a questionnaire on potato scab in the Northeastern States, presented by J. A. Chuka, and discussion and summary of a potato scab survey in the Southern States, by H. T. Cook.

Potato virus disease studies with tuber-line seed plots and insects in Maine, 1927 to 1938. D. FOLSOM (*Maine Sta. Bul.* 410 (1942), pp. [3]+215-250, pls. 4, fig. 1).—Potato seed-plot work begun in 1921 and based on virus-disease discoveries at about that time has been continued by the author with emphasis in recent years on aster-cloth cages, shown to be efficient in excluding insect vectors, and tuber-unit planting, the helpfulness of which was demonstrated. At first it was hoped that healthy tuber-lines could be increased in size in comparatively isolated open-field plats without appreciable virus infection. The ultimate failure of this method led to the second phase of the studies, in which an attempt was made to determine the frequency of passage of virus diseases into healthy tuber-line plats. Only in this way could field-to-field transmission be adequately studied, since tuber-line plats were the only kinds initially free of infection. A third phase concerned the effects of various conditions on disease invasion of seed stocks in tuber-line plats, including latitude, earliness of planting and development of plants, size of seed plat, and so-called isolation on the passage of disease into the plats and on the increase of disease within them.

At Highmoor Farm (1927-32), 21 tuber-line seed plats grown in the open were invaded by one or another of the virus diseases present in other potatoes on the same farm, in 15 of 75 possible chances. On 74 different farms (1933-38), 114 tuber-line seed plats were also grown, in each case with a follow-up inspection of the progeny during the succeeding year to disclose what virus diseases had been brought into the seed plat by insects and to what extent. The detailed results are presented and discussed. The cages excluded virus diseases perfectly when erected before the plants emerged. In the open, mosaic and leaf roll usually increased in spite of roguing or came in where previously absent. Earlier planting and earlier development of the plants in the seed plat increased the possibility of success in disease

control. The certification proximity rule did not prove a safe guide as to amount of disease entering healthy plants. Giant-hill was found not to spread. Two aphids (*Macrosiphum solanifolii* and *Aphis abbreviata*) transmitted leaf roll under some experimental conditions, whereas four other insects tested, as well as root contact in the soil, did not. Insect counts in the field indicated the latter group of insects (flea beetles, Colorado potato beetle, apple leaf-hopper, and tarnished plant bug) to be unimportant in the spread of the virus diseases. There are 25 references.

More potato research results in stronger endorsement of zero tolerance in seed (*Colo. Farm Bul. [Colorado Sta.], 4 (1942), No. 2, pp. 17-18*).—A brief report of progress on the station studies of potato ring rot, by W. A. Kreutzer, D. P. Glick, J. G. McLean, and G. M. List, is presented, with the conclusion that "zero tolerance probably will prevent increase of ring rot in Colorado seed; 1 or 2 percent tolerance will not." Laboratory tests have indicated that ring rot bacteria can be transmitted from diseased to healthy plants by grasshoppers, blister beetles, and Colorado potato beetles, though no actual record of field spread by insects has been obtained. Recommendations for cut seed treatment and cleaning up of foundation-stock tubers are made.

Washing and sterilizing potato bags, W. E. BRENTZEL (*North Dakota Sta. Bimo. Bul., 4 (1942), No. 5, p. 20*).—Contaminated bags were found to spread ring rot, but those washed a few minutes in a small amount of soda ash, followed by boiling in a chlorine bleach and final rinsing in cold water, did not. The process removed all brand marks and shrunk them slightly, but did not materially injure the strength of the fiber.

Scurf, black rot, and stem rot of sweet potatoes, R. H. DAINES (*New Jersey Stas. Cir. 437 (1942), pp. 8, fig. 1*).—Because of the similarities in these three serious diseases of different causation, certain of the measures providing relief from their attacks are also similar. Descriptions and control measures are presented.

Bacterial leafspots of Pennsylvania tobacco.—I, Occurrence and nature of the microorganism associated with wildfire, J. J. REID, J. NAGHSKI, M. A. FARRELL, and D. E. HALEY (*Pennsylvania Sta. Bul. 422 (1942), pp. [2]+36, fig. 1*).—The following conclusions are drawn from studies of a large number of green-fluorescent gram-negative bacteria isolated from seedbed soils as well as from plant material derived from seedbed and field:

Extensive serological tests with single-cell isolations indicate the organism associated with the wildfire disease to be identical antigenically with the common saprophyte, *Pseudomonas fluorescens*. Similar studies lead to the same conclusion with respect to *Phytomonas angulata*, *P. primulae*, and *P. cerasi*. Due to the inability to maintain cultures of *P. vignae* and *P. syringae* in the S phase, it has thus far not been possible to compare these species antigenically with *Pseudomonas fluorescens*, but the data obtained suggest a similar relationship. A study of the transformation of the capsular antigenicity of *P. fluorescens* on normal clover plants permitted the assumption that the antigenic specificity of the wildfire organism in the M phase is a reflection of capsular changes occurring during the reproduction of the organism as a harmless epiphyte. Seedbed steaming as practiced in Lancaster County does not result in eliminating the bacteria associated with the leaf spot diseases of tobacco. On the contrary, they are more prevalent afterwards than before. In this area tobacco as a rule is produced in the presence of leaf spot organisms, inasmuch as those associated with such diseases have been found in all seedbeds examined and on most plant material from seedbed and field. Since they have been found on most normal as well as diseased tobacco plants, it is believed that

the appearance of the disease cannot be attributed to their mere presence, but to some other factor or factors. There are 26 references.

Tobacco mosaic in Ontario and Quebec, G. H. BECKLEY (*Sci. Agr.*, 22 (1942), No. 8, pp. 465-478).—The virus was found capable of overwintering in the soil, thus necessitating crop rotation to avoid primary field infections from that source. Evidence is presented that mosaic may be readily spread during transplanting, especially if the help use tobacco in any form. Cultivation proved one of the most important agencies of spread, and roguing was demonstrated to be of material aid in checking it. In topping a field of tobacco where mosaic is present it is advised that the healthy plants be handled first.

Three strains of cucumber mosaic occurring on tobacco in Ontario and Quebec, J. H. H. PHILLIPS (*Canad. Jour. Res.*, 20 (1942), No. 6, Sect. C, pp. 329-335, pl. 1).—From diseased material collected in Ontario and Quebec three virus strains were isolated and designated Nos. 1 to 3. "Strain 1 most closely resembled typical cucumber mosaic in its symptoms on tobacco and tomato. Strain 3 produced a similar type of mottle to strain 1, but was generally more severe and consistently produced severe leaf narrowing on tomato. Strain 2 was easily recognized by its ability to produce necrotic rings on the inoculated leaves of burley tobacco varieties and the tendency of affected plants to recover from the initial symptoms. The three strains retained their identity through a large number of serial inoculations. Investigations demonstrated that a severe type of streak was produced when tomato plants were inoculated with a combination of cucumber mosaic virus (strain 3) and potato X virus. Unlike tobacco mosaic virus, the virus of cucumber mosaic was unable to survive over winter in plant tissue in the soil. Field observations indicated that dissemination of cucumber mosaic in tobacco plantings was effected by insect vectors."

Infectivity of extracted, unpreserved tobacco mosaic virus retained 28 years, H. A. ALLARD. (U. S. D. A.). (*Science*, 95 (1942), No. 2471, p. 479).—The tests reported appear to indicate that the retention of virulence in extracted, unpreserved sap depends on the type of fermentation which gains control under certain conditions.

Varietal reaction to bunt in the western wheat region of the United States, C. S. HOLTON and C. A. SUNESON. (U. S. D. A. and Ariz., Calif., Idaho, Mont., Oreg., Utah, Wash., and W. Va. Expt. Stas.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 1, pp. 63-71).—The reactions of 83 varieties and hybrid selections of winter wheat to bunt were determined by growing them in uniform nurseries at 11 localities in the western United States and at Kearneysville, W. Va., and inoculating with spores from commercial wheat fields near each nursery or from a composite of collections from commercial wheat fields in the entire Pacific Northwest. None proved bunt-free at all stations, although 36 varieties averaged less than 10 percent and 7 less than 1 percent. In the production of 26 of the 27 most resistant hybrid selections 5 resistant varieties were involved. In 8 of the 12 nurseries the majority of the infected varieties and selections had less than 10 percent of bunt. The prevalence and distribution of race groups of the bunt fungi were indicated by the reactions of the host testers included in the nurseries each year. One or more of the most virulent races appeared to be fairly prevalent throughout the western region.

Studies on the pathogenicity of *Fusarium* species associated with root rot of wheat, C. L. JOHNSTON and F. J. GREANEY (*Phytopathology*, 32 (1942), No. 8, pp. 670-684).—Pathogenicity tests in the greenhouse were made with *F. culmorum*, *F. oxysporum aurantiacum*, *F. avenaceum*, and *F. equiseti*, the *Fusarium* species most commonly isolated from root-rotted wheat and from

grain soils in Manitoba. Of the 24 isolates of *F. culmorum* studied, only one proved distinctly pathogenic to both seedling and adult wheat plants and no marked pathogenicity was exhibited by any of the other species used. Field tests with these fungi gave essentially similar results. In the greenhouse, soil moisture content did not influence the virulence of these organisms on wheat seedlings, but, in general, the intensity of infection increased with an increase in soil temperature. In greenhouse pot tests, *Trichoderma lignorum* and *Pyronema confluens*, two common soil inhabitants, suppressed the pathogenicity of a very virulent isolate of *F. culmorum*, whereas *Penicillium intricatum* and *Aspergillus flavipes* did not. The virulence of *F. redolens*, a very weak pathogen, was not influenced by the presence of *P. intricatum* and *A. flavipes* in the soil. There are 32 references.

An unusually virulent race of wheat stem rust, No. 189, G. GARCIA-RADA, J. VALLEGA, W. Q. LONGERER, and E. C. STAKMAN. (Minn. Expt. Sta. coop. U. S. D. A. et al.). (*Phytopathology*, 32 (1942), No. 8, pp. 720-726, figs. 2).—In Peru, an extraordinarily virulent race of *Puccinia graminis tritici* (now numbered 189 in the Stakman-Levine key) was isolated from heavily infected Khapli emmer. This is the only race known to cause heavy infection on all the differential wheat varieties used in identifying physiologic races. Furthermore, it attacks a number of hitherto resistant varieties in the field, as shown by the fact that Khapli emmer, Hope wheat, and *Triticum timopheevi* were all severely rusted by it in Peru. Thus far the race has been found only in Peru, and it seems improbable that it has been in the United States, since Khapli emmer is one of the differential varieties used in identifying races and has been inoculated with all the collections identified during the past 20 yr. Moreover, Khapli has proved resistant when grown in the field in many places in this country since 1908. The origin of race 189 is unknown, but it occurs in an area in which rust is known to develop on native barberries and it seems likely that it may have resulted from an unusual combination of genes following sexual fusion on that host. This combination having been made, it seems not unlikely that it may be made again in other regions. It is also possible that spores might be blown from Peru to other areas where this rust does not now occur, and it is even possible that this race might be disseminated northward and across the equator, though this possibility may be somewhat remote.

Microbiological and nutritional factors in the take-all disease of wheat, C. R. STUMBO, P. L. GAINEX, and F. E. CLARK. (Kans. Expt. Sta. coop. U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 11, pp. 653-665, figs. 4).—In wheat-cropped soils of similar texture, differences were not found in numbers or kinds of micro-organisms in take-all infested and noninfested field areas, nor was there apparent any correlation between levels of available P and incidence of infection. In greenhouse tests wheat straw and inorganic fertilization applied to the soil at planting time failed to control the disease. With superphosphate fertilization at seeding time and inorganic N slightly in excess of the amount calculated as necessary for plant growth applied during the growing season, the severity of take-all was reduced by increasing the amounts of superphosphate. With both available-P and nitrate-N content maintained at suitable levels, successful control was obtained even though significant differences in microbial numbers were not encountered.

Causes, effects, and control of defoliation on tomatoes, J. G. HORSFALL and J. W. HEUBERGER (*Connecticut [New Haven] Sta. Bul.* 456 (1942), pp. 181-223, figs. 9).—In this 12-season study, particular emphasis was placed on solving the seeming paradox of reduced yields from sprays despite disease control, the problem being attacked by studying plants in different stages of disease

and the varying control obtained by different sprays. Though the primary cause of defoliation in the Northeast is *Alternaria solani*, it is not a vigorous parasite and optimum conditions for infection include crowded plants, leaf maturity, heavy fruit load, above normal rainfall and dew, and shading. A special study of fruit load and age of tissues to susceptibility appeared to indicate that any factor such as pruning, low N nutrition, or heavy reproduction tends to increase susceptibility. This proved especially true of fruit load. The longer the plant remained free of fruit the longer it also remained free of *Alternaria*, and the more fruit set the more susceptible it became. Extensive studies of the effects of disease and of spraying gave no evidence that they influence fruit maturity, i. e., ripening. Many factors such as disease, dwarfing, and defoliation from sprays reduce fruit load, and in turn these of course affect the number of fruits picked and so the shape of the picking curve.

In studying the disease-controlling properties of fungicides, a protective coefficient was devised for reducing the variance among tests due to inoculum potential, spraying technic, method of recording disease, and kind of disease. It is the quotient obtained by dividing the amount of disease on plants sprayed with a standard by that on the test material, and it is based on the assumption that as extraneous factors affect the unknown they also affect the standard. The tests on copper-containing bordeaux substitutes rate them as good, intermediate, and poor. Those in the first group appeared to be yellow copper oxide, bordeaux, red copper oxide, Compound A, Coposil, and Tenn. 34. Those in the "intermediate" group were Basicop, Hydro 40, and Cuprocid 54. Those in the poor group were Metrox, ZO, Cupro K, and hydrated cupric oxide. Timing of tomato sprays proved of critical importance in economical control of defoliation. To reduce spray injury to the plants, applications should be delayed as long as is compatible with satisfactory disease control. Consideration of all the data at hand suggests that in Connecticut the first spray should be applied just as the plants break over. Coverage is important in spraying ground tomatoes, since the lower and inner leaves are most susceptible to defoliating fungi. It is suggested that the spray nozzle should be as large as possible, so that the spray stream will be hard enough to push aside the outer crown of leaves. There are 45 references.

A micrurgical study of crown gall infection in tomato, E. M. HILDEBRAND. ([N. Y.] Cornell Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 65 (1942), No. 1, pp. 45-59, figs. 7).—Tomato plant-juice extract proved excellent for culturing *Phytoplasma tumefaciens*; and single bacterial cells grew readily in microculture therein. The sap in the wound cavity liberated from the plant cells injured in the wounding operation also supported growth of the bacteria. Isolations from wounds about 5 days after inoculation and before symptoms appeared showed that the original single cells had multiplied into thousands of individuals in the wound sap. When injected into the cells of tomato stems the crown gall organism failed to induce gall formation and ordinarily failed to survive inside the cells, indicating the living cell interior to be an unfavorable medium for it.

Single bacterial cells induced gall formation when introduced into needle-puncture wounds of various sizes. The lower percentage of infections resulting from single-cell inoculation as contrasted with that from inocula consisting of larger numbers was attributed to chance distribution favoring the larger numbers reaching the proper position for multiplication and cell stimulation. Tiny wounds in the stem, involving one or more epidermal cells, approximated the minimum size for infection, and only a small percentage of such wounds became infected when the inoculum was applied by gently rubbing the stem surface with a polished needle moistened with a bacterial suspension. With

identical inocula shallow stem wounds (about 2-12 cells deep) were less efficient than deep wounds as infection courts. This result is attributed to chance distribution of the bacteria and to the larger amount of wound sap favoring the larger wounds as infection courts.

Ordinarily the ultimate size of the gall was correlated with depth of wound but was independent of size of initial inoculum. The largest galls observed resulted from inoculating deep stem wounds regardless of whether the inoculum was one or a large number of bacterial cells. The relations (1) between tiny wounds, tiny galls, and few bacteria, (2) between shallow wounds, small galls, and more bacteria, and (3) between deep wounds, large galls, and many bacteria were verified by isolation experiments. There are 18 references.

A survey of the genus *Lycopersicon* for resistance to the important tomato diseases occurring in Ohio and Indiana, L. J. ALEXANDER, R. E. LINCOLN, and V. WRIGHT. (Coop. Ohio and Ind. Expt. Stas.). (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1942, Sup. 136, pp. 51-85*).—At the Ohio and Indiana Experiment Stations 448 (including 5 species) of the Bureau's introductions of members of the genus *Lycopersicon* have been tested and classified for disease reactions in an effort to locate sources of resistant germ plasm for use in tomato breeding programs. Tests have been made for resistance to practically all the important tomato diseases occurring in the north central region of the United States, and these data are brought together in this contribution. In some species high resistance was found to *Fusarium* wilt, leaf mold, *Septoria* and *Alternaria* leaf blights, common tobacco mosaic, and bacterial spot, and resistance to *Colletotrichum* ripe fruit rot was also indicated. No marked resistance to bacterial canker or bacterial wilt was found. Wide differences in the severity of cracking of red-fruited introductions were observed. What appeared to be resistance to red spider was noted in one species. There are 11 references.

The effects of certain mosaic-inducing viruses on the tomato crop under glass, I. W. SELMAN (*Jour. Pomol. and Hort. Sci., 19 (1941), No. 1-2, pp. 107-136, pls. 3, figs. 9*).—The diversity of the symptom pictures induced by one or the other of tobacco virus 1 and of two strains of tomato mosaic viruses (and also of cucumber virus 1 successfully inoculated into a few tomato plants) at different times of the season and in the same plant is pointed out. Enations were associated with the cucumber virus and the two strains of tomato mosaic, but not with the tobacco virus, and their origin is discussed. There was evidence that they can be induced in infected plants allowed to develop freely after subjection to hardening conditions. Light brown streaks appeared on one plant inoculated with the tobacco virus. Severe wilting was noted in the plants inoculated with one of the tomato strains at the appearance of symptoms. For the tobacco and both tomato viruses, high partial correlation coefficients existed between the mean number of daylight hours during which the plants were exposed to 70° F. or over and the percentage showing a mild light and dark green leaf mottle only. Controls produced significantly more flower buds on trusses 2-5 than did early-infected plants, the greatest difference being in the fourth truss. A significant reduction in number of fruits was occasioned by early infection. The percentages of flower buds producing fruits was lowered by early infection in all cases, as was the total yield of ripe fruit from five trusses. Early infection induced very slight increases in the percentage of blotchy fruit. A very small reduction in the weekly rate of leaf production was recorded with infected plants during the 9 weeks following inoculation, and a marked though temporary check was noted at the time the symptoms appeared. Infection significantly reduced the weekly height incre-

ment of the main stem during the first 9 weeks of the experiment. The time of appearance of symptoms is considered to be the most critical stage in the metabolism of an infected plant, and the importance of this stage in devising control methods is pointed out. There are 22 references.

Handbook of virus diseases of stone fruits in North America, E. M. HILDEBRAND, G. H. BERKELEY, and D. CATION. (Coop. Cornell Univ. et al.). (*Michigan Sta. Misc. Pub.*, 1942, pp. 76).—As noted in the foreword, by V. R. Gardner, the gradually increasing seriousness of the virus disease problem in stone fruits has been a matter of growing concern, and at the suggestion of several pathologists a conference to consider the question was held at Michigan State College in September 1941. One of the outgrowths of this meeting was the selection of a committee to assemble and organize both published and unpublished data on the nomenclature, symptoms, host range, geographic distribution, and other characteristics of the virus diseases of this group of trees. The present handbook is the result, its purpose being to make immediately available an up-to-date summary of the information known about stone fruit virus diseases, including certain ones not hitherto reported.

Four new virus diseases of stone fruits found in peach mosaic study in Colorado, E. W. BODINE, J. H. NEWTON, and W. A. KREUTZER (*Colo. Farm Bul.* [*Colorado Sta.*], 4 (1942), No. 2, pp. 6-10, figs. 4).—Brief histories and descriptions of the course and symptoms are given for the golden net virus disease of apricot, plum, and peach; rasp-leaf of cherry; ring spot of apricot; and X-disease of peach.

Indexing cherry yellows on peach, E. M. HILDEBRAND (*Phytopathology*, 32 (1942), No. 8, pp. 712-719, figs. 2).—Cherry yellows was transmitted by budding and grafting from diseased to healthy sour cherries with the production of definite yellow-leaf symptoms within about a year, and similar incubation periods were obtained in transmissions from cherry to peach. Symptoms on the latter consisted mainly of a stunted rosette-type of growth. New indexing technics were developed which shorten the incubation periods to about a month. One method, which involved placing diseased cherry buds between two small rapidly growing shoots on cut-back peach grafts, induced early-stage symptoms within 2 weeks; another, which consisted of budding midway up the stem of large peach seedlings and cutting back to one node above the diseased bud, resulted in early-stage symptoms within a month; the third and most useful technic, which employed small 18-inch-tall seedlings, gave incubation periods of about 3 weeks when pruning followed immediately after budding. These rapid indexing technics are proving of great value in advancing the work on cherry yellows and should be applicable to other stone-fruit viruses.

Tomato ringspot on currant, E. M. HILDEBRAND. ([N. Y.] Cornell Expt. Sta.). (*Amer. Jour. Bot.*, 29 (1942), No. 5, pp. 362-366, figs. 4).—A virus recovered in the juice extract from currant produced a disease on tobacco practically identical with tomato ring spot and considered a strain of this virus, since it agreed in all important particulars with the possible exception of being more virulent. Furthermore, cross-immunization tests with other ring spot viruses resulted in protection only against tomato ring spot, with which the host range, so far as tested, agrees. This is believed the first case of mechanical transmission of a virus from a woody plant to tobacco, and thus far it has not been possible to return the virus to currant by this means. Since the ring spot virus was obtained from some and not from other mosaicked currant plants, it is tentatively concluded that two entities are involved, viz, currant mosaic and tomato ring spot.

Notes on resistance and susceptibility of gladiolus varieties to the Fusarium yellows, L. McCulloch. (U. S. D. A.). (*Gladiolus* [New England Gladiolus Soc.], 1942, pp. 80-83).

More about control of black spot on roses, E. W. Lyle. (Tex. Expt. Sta.). (*Florists Exch. and Hort. Trade World*, 98 (1942), No. 21, p. 10, fig. 1).—Following a previously published digest⁴ of work on this disease by the Texas Experiment Station, the author here presents further data confirming the value of sulfur-copper dusts over sulfur alone in preventing infection. Best results were obtained from applications made within 24 hr. after each rain.

Bacterial blight of garden stocks and its control by hot-water seed treatment, J. B. Kendrick and K. F. Baker (*California Sta. Bul.* 665 (1942), pp. 23, figs. 6).—A bacterial blight of garden stocks in California has occurred for several years in cut-flower and commercial seed plantings and in home gardens. The disease attacks the main stem and lateral branches at all stages of plant growth, and its symptoms are described in detail. The principal damage has been a serious reduction in seed production during certain seasons, but many plants are also killed outright or badly stunted. The disease was readily reproduced by pure culture inoculations, and the pathogen, culturally and morphologically resembling *Phytomonas campestris*, is described and named *P. incanae* n. sp. The bacteria invade the vascular system and have been recovered from the stem, lateral branches, peduncles, and seed. Seed from infected plants when sown in steam-sterilized soil gave a small percentage of diseased progeny. Immersion of stock seed in water at 53°-55° C. for 10 min., followed by prompt cooling, resulted in complete control or greatly reduced the incidence of seedling infection in the greenhouse without material injury to the seed, and in field practice the occurrence of the disease was greatly reduced and seed production increased. Observations indicate that the pathogen persists in the soil, and thus a 2- or 3-yr. rotation is recommended. Drainage water from infested fields will spread the disease. Infested garden or greenhouse soil can be sterilized by steam or by soaking to a 6-in. depth with formaldehyde (1-50). There are 19 references.

The control of chlorosis in cottonwood trees and other plants, G. H. Starr (*Wyoming Sta. Bul.* 252 (1942), pp. 16, figs. 5).—Chlorosis, a common malady of different plants in various Rocky Mountain States, has been destructive to cottonwood and other trees in Laramie and elsewhere in Wyoming. The form most common in Laramie is apparently due to Fe deficiency, since it can be cured by direct treatment with Fe salts. The experiments reported indicate that placing ferric phosphate in holes in the tree is the most successful treatment yet found, and it is recommended. Of 113 trees treated in 1938 only 27 showed the need of another application by the end of the 1941 season. Other ferric salts have also been used successfully, especially ferric citrate. Ferrous salts have not given satisfactory results when injected, but a solution of ferrous sulfate (copperas) has corrected the chlorosis of herbaceous plants, shrubs, and small trees when applied as a spray.

Phloem necrosis: A virus disease of the American elm, R. U. Swingle (U. S. Dept. Agr. Cir. 640 (1942), pp. 8, figs. 4).—This disease caused an epidemic dying of American elms in the central and lower Ohio River watershed. It is identified by examining the inner bark of buttress roots or the lower trunk of phloem necrosis suspects for a yellow, yellowish-brown, or "butterscotch" discoloration and a faint odor of wintergreen. This discoloration is not usually found in branches and never occurs in the wood. Means of spontaneous spread under field conditions are not known, but the disease is readily transmitted by

⁴ Florists Exch. and Hort. Trade World, 98 (1942), No. 19, p. 11.

grafting. No cure is at present known, and no measure for the protection of healthy trees has yet proved effective.

Toxin formation by *Ceratostomella ulmi*, G. A. ZENTMYER. (Conn. [New Haven] Expt. Sta.). (*Science*, 95 (1942), No. 2472, pp. 512-513).—In this preliminary report on experiments begun in 1940, evidence is presented that *C. ulmi* produces a soluble toxic substance which is believed to be the primary factor in the pathogenesis of the Dutch elm disease, typical symptoms having been produced by injecting a sterile filtrate from cultures of the fungus. The significance of the finding and the chemotherapeutic possibilities are discussed.

A bluestaining fungus inhabiting the heartwood of certain species of conifers, C. M. CHRISTENSEN and F. H. KAUFERT. (Minn. Expt. Sta.). (*Phytopathology*, 32 (1942), No. 8, pp. 735-737, fig. 1).—A bluestaining fungus was isolated from the heartwood of each of more than 50 white cedars (*Thuja occidentalis*) in Minnesota. No spores were formed, but it propagated readily by hyphal fragmentation. Inoculated with this fungus, sterilized pieces of heartwood developed the typical dark blue stain. The pathogen grew through all the wood elements much as do some wood-rotting fungi. One or more other fungi were closely associated with the stain fungus in the wood and have been recovered invariably with the latter in isolations on agar media.

The biology of *Fomes fomentarius*, M. T. HILBORN (*Maine Sta. Bul.* 409 (1942), pp. [3]+161-214, pls. 17, figs. 4).—The author's general observations indicate that *F. fomentarius* is among the most important decay-producing fungi attacking hardwoods, which make up much of the 15,000,000 acres of Maine forests, and that it attacks birch more frequently than most other trees. About 27 binomials have from time to time been applied to the fungus, which has been reported from most parts of North America and from the British Isles, Europe, China, Japan, and Africa on 23 genera and 53 species of trees. In New England it is practically restricted to species of birch and beech. The morphology of the sporophore was studied in detail, and the spore-discharge period was found to cover about 180 days and to be influenced by humidity, temperature, and food reserves present. A considerable variation in the time-growth curve in culture was noted for various isolates on the same medium and for cultures of the same isolate on different media, but the group of 28 isolates from North America and Europe studied gave no indication of the existence of strains or local races within the species. No significant differences were observed in the reaction of the isolates to temperature, acidity, or the ability to produce the oxidase reaction on gallic- or tannic-acid media. All isolates exhibited mutual aversion when any two were plated together.

The fungus destroyed heartwood and sapwood at equal rates in cultures, but different isolates varied in the rapidity with which they destroyed wood from the same source and in their saprogenicity according to the tree species. Field studies showed that the parasite causes a typical white mottled rot in the heartwood and sapwood of living and dead trees, apparently attacking both parts simultaneously in dead trees but the heartwood first in living trees. Cell walls were found to be penetrated in various ways, and the secondary cell wall is probably invaded following the ramification of the hyphae through the wood parenchyma and wood ray cells. Lignin and cellulose are attacked simultaneously, and no differences were found in the utilization of pentosans. The decrease in alkali solubility characteristic of the white rots was also noted here. Losses in calorific value of decayed wood were proportional to the reductions in dry weight. There are 88 references.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Interrelations of rodents and other wildlife of the range, E. E. HOEN and H. S. FITCH (*California Sta. Bul. 663 (1942), pp. 96-120, figs. 3*).—The subject is dealt with under the headings of wildlife and its interrelations, rodents and rabbits of the range, factors influencing rodent and rabbit abundance, and effect of rodents on vegetation in the enclosures, the details being given in seven tables. The pounds per acre of forage remaining in the fall on comparable areas subjected to use by different kinds of animals in 1937-39 is summarized in a graph.

Control of moles, L. HASEMAN (*Missouri Sta. Cir. 233 (1942), pp. [4], figs. 2*).—A practical account.

Studies on valley quail, T. I. STORER, F. P. CRONMILLER, E. E. HOEN, and B. GLADING (*California Sta. Bul. 663 (1942), pp. 130-135*).—Report is made of studies commenced in the autumn of 1936 by the Cooperative Quail Study Committee, organized to plan and direct work on the California valley quail (*Lophortyx californica vallicola*), the principal upland game bird of the Sierra Nevada foothills. The findings, which are summarized in tables, include censuses of valley quail on the range, principal types of cover used by quail for nesting, summary of nesting data for valley quail at the San Joaquin Experimental Range, and losses in nesting of valley quail. It is pointed out that, while final conclusions and definite management recommendations must be based on further studies, these statements of progress will illustrate the results thus far obtained.

Management of farm fish ponds, H. S. SWINGLE and E. V. SMITH (*Alabama Sta. Bul. 254 (1942), pp. [2]+23, figs. 15*).—The principles of pond management are first dealt with, followed by an extended discussion of the management of fish ponds, including proper stocking for new ponds, management of old ponds, fertilization of ponds, fishing, pond weeds and their control, and mosquito control.

[Insect investigations by the Idaho Station]. (Partly coop. U. S. D. A.). (*Idaho Sta. Bul. 244 (1942), pp. 36-39*).—Progress (E. S. R., 85, p. 786) notes by W. E. Shull, R. A. Fisher, H. C. Manis, E. L. Turner, M. C. Lane, F. H. Shirck, T. A. Brindley, and F. G. Hinman which mention dusts for legume bug control, control of *Empoasca flamentosa* DeLong obtained, alfalfa in rotation reduces wireworm population, and reduced per acre poundage of rotenone dust shows possibility in pea weevil control.

[Investigations in economic zoology and entomology by the Indiana Station]. (Partly coop. U. S. D. A., Ohio Expt. Sta., et al.). (*Indiana Sta. Rpt. 1941, pp. 60-67, figs. 2*).—A progress report (E. S. R., 86, p. 65) by G. A. Ficht, T. E. Henton, S. A. Anderson, R. H. Wileman, W. B. Cartwright, D. W. LaHue, C. Benton, P. Luginbill, H. R. Painter, E. V. Walter, G. E. Gould, G. E. Marshall, F. P. Zscheile, N. F. Childers, H. W. Brody, L. F. Steiner, J. E. Fahey, E. N. Woodbury, G. C. Oderkirk, and C. M. Kirkpatrick noting studies on the European corn borer, including work with lights and plowing under corn for control; cutworm research; hessian fly-resistant wheats; white grub control in turf; corn earworm and cucumber beetle studies; plant bug injury to tomatoes; control of gladiolus thrips; notes on the apple and grape leafhoppers; studies on the codling moth and oriental fruitworm; cockroach control; work of the Federal Fruit Insect Laboratory; organic chemicals as insecticides; rodent control; studies on rabbit repellents; groundhog or woodchuck control; and an ecological rat survey.

[Investigations in economic zoology and entomology by the Puerto Rico Station]. (Partly coop. U. S. D. A. et al.). (*Puerto Rico Sta. Rpt. 1940, pp. 36, 50, 65-85, figs. 6*).—A progress report (E. S. R., 84, p. 639), noting

scale insect control on bamboo by introduced insect predators; the fall armyworm; corn earworm, and corn-silk fly *Euxesta stigmatias* Loew as pests of sweet corn ears; effective methods for controlling corn ear pests; and, by K. A. Bartlett, introduction of five new species of beneficial insects; *Diatraea* borers for rearing parasites; introduction, liberation, and recovery of two strains of the Amazon fly *Metagonistylum minense* Tns.; shipments of *M. minense* to Louisiana and Barbados; liberations of *Theresia claripalpis*, a parasite of the sugarcane borer, at Guayama; shipment of *Coelophora inaequalis*, a predator of the yellow sugarcane aphid *Sipha flava* Forbes, to Louisiana; effective reduction of population of the coconut mealybug by the parasite *Pseudophycus utilis* Timb.; notable reduction in pineapple mealybug infestation in Lajas District through establishment of the parasite *Hambletonia pseudococcina* Comp.; a ladybeetle, *Egilus platycephalus* Muls., effective against the bamboo scales (*Asterolecanium bambusae* Bdv. and *A. miliaris* Bdv.); several scale predators (*Cladis nitidula* F., *Curinus* sp., and *Penttila castanea* Muls.) well established in various sections of the island; a coccinellid predator, *Ohilcorus cacti* L., proved useful for combating the white peach scale on papaya; receipt of shipment of the ladybeetle *Erochomus jourdanii* Muls., a new predator of bamboo scales, from Brazil; redistribution of bamboo scale predators to new localities; shipment of the adults of the bamboo scale predator, *Egilus platycephalus*, to Haiti; introduction of black scale parasites from California; shipment of negro scale, *Saissetia nigra* Niet., to California for rearing of parasites and predators; shipment of *Spalangia* sp. to Colombia to aid in control of the hornfly of cattle; and shipment of the giant toad *Bufo marinus* to Cuba. Biological studies and control of the bamboo powder-pot beetle *Dinoderus minutus* F. are noted by H. K. Plank.

Cotton insect problem met by research information as basis of poison program, C. LYLE (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 6, pp. 1, 5-6).—A practical account.

Daytime use poison dusts is effective, C. LYLE (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 5, pp. 1, 8).—A practical account.

Insecticides for victory gardens, N. P. LARSON (*South Dakota Sta. Cir.* 40 (1942), pp. 16).—A practical account.

Grasshopper control aided by tillage methods, J. A. MUNRO and H. S. TELFORD (*North Dakota Sta. Bul.* 309 (1942), pp. 14).—As a result of experiments conducted from 1939 to 1941 it was concluded that plowing or fall disking is useful in preventing subsequent grasshopper development. The relative effectiveness of different methods was as follows: (1) Moldboard plowing (fall) 96 percent, (2) one-way disk plowing (fall) 90, (3) double disking (fall) 86, (4) moldboard plowing (spring) 83, (5) duckfoot cultivation (fall) 73, (6) one-way disk plowing (spring) 69, (7) duckfoot cultivation (spring) 58, and (8) double disking (spring) 40 percent. Apparently the efficiency of plowing is the result of placing egg pods at lower soil levels where lower temperatures prevail during the incubation period, which results in delayed hatching and prevents subsequent emergence to surface. Double disking was probably correlated with the interval of time between the treatment and the beginning of the hatching period. Plowing for summer fallow is deemed valuable when begun from the outer margin of the field and so continued as to leave a narrow strip of vegetation for the concentration and subsequent poisoning of the grasshoppers. Cultivation just prior to egg-laying discourages oviposition in tilled areas. Temperature and direction of wind currents may be the main factors accounting for the varying efficiencies of tilled barriers for preventing the invasion of crops by grasshoppers.

The carrot weevil (*Listronotus latiusculus* (Behe)) in New Jersey and its control, B. R. PEPPER (*New Jersey Stat. Bul.* 693 (1942), pp. 20, figs. 7).—

The biology, habits, and control of the carrot weevil, a serious pest of celery, carrots, and parsley in certain sections of New Jersey, has been considered. Spraying and dusting with organic materials in celery fields gave poor control. Lead and calcium arsenate in sprays or dusts reduced injury 80 to 85 percent. Most effective control was obtained with a poison bait consisting of 95 lb. of dried apple pomace and 5 lb. of calcium arsenate broadcast at the rate of from 40 to 50 lb. per acre every 15 to 20 days.

Biological control of *Diatraea mauriciella* Wlk. in Mauritius.—I, **Investigations in Ceylon in 1939**, J. VINSON (*Bul. Ent. Res.*, 33 (1942), No. 1, pp. 39-65, figs. 7).—This is a report of an investigation in Ceylon from January to June 1939 of the moth borer *D. mauriciella*, a serious pest of sugarcane in Mauritius.

Crops or cutworms, G. F. KNOWLTON (*Farm and Home Sci. [Utah Sta.]*, 3 (1942), No. 2, p. 12).—A practical account.

Wireworm injury and potato varieties, H. S. TELFORD (*North Dakota Sta. Bmo. Bul.*, 4 (1942), No. 5, pp. 7-8).—During 1940 and 1941 the potato varieties Warba, Red Warba, Sebago, and Bliss Triumph were less heavily attacked than Pontiac, Cobbler, Mesaba, and Early Ohio. Apparently more wireworm injury occurs in the potato varieties which have fewer tubers per hill and which have their tubers growing in close proximity to one another.

Preparing bees for winter, R. S. FILMER (*New Jersey Stas. Cir.* 424 (1942), pp. 4).—A practical account.

Package bees, R. S. FILMER (*New Jersey Stas. Cir.* 426 (1942), pp. 4).—A practical account.

Lice and mites of livestock, H. E. BROWN (*Missouri Sta. Cir.* 231 (1942), pp. [4], fig. 1).—A practical account.

Ticks infesting domestic animals in Southern Rhodesia, R. W. JACK (*Rhodesia Agr. Jour.*, 39 (1942), Nos. 2, pp. 95-109, pl. 1; 3, pp. 202-218, figs. 2).—This is a revision of the contribution noted (*E. S. R.*, 81, p. 402), which includes (1) tables of diseases known to be transmitted by southern Africa ticks and (2) species of ticks recorded to date in Southern Rhodesia.

The keg shelter as a diurnal resting place of *Anopheles quadrimaculatus*, G. E. SMITH (*Amer. Jour. Trop. Med.*, 22 (1942), No. 3, pp. 257-269, figs. 5).—Investigations conducted have led to the conclusion that light traps and baited traps do not give an adequate measurement of the common malaria mosquito density. It was established that this species seeks a suitable diurnal shelter at dawn. An empty nail keg tends to provide such a shelter. These keg shelters when properly located near mosquito breeding places show promise as a means of defining anopheline densities in localized areas. They have the advantages of uniformity and mobility which are lacking in conventional collecting stations.

Subspecific variations among neotropical *Anopheles* mosquitoes and their importance in the transmission of malaria, L. E. ROZEBOOM (*Amer. Jour. Trop. Med.*, 22 (1942), No. 3, pp. 235-255, pls. 5).—This contribution is accompanied by a four-page list of references to the literature cited.

Studies on copper arsenite, a new anopheline larvicide, E. H. HINMAN, R. L. CROWELL, and H. S. HUELBUT (*Amer. Jour. Trop. Med.*, 22 (1942), No. 3, pp. 271-281).—Description is given of the laboratory technic of biological assay of arsenical dusts as anopheline larvicides. "From a preliminary survey of a wide variety of arsenites, copper arsenite and calcium arsenite were selected for more intensive study as larvicidal dust. . . . In the field it has been demonstrated that copper arsenite is at least the equivalent of paris green as a larvicide despite the fact that quantitative sampling indicated that only a small fraction actually reaches the water surface. Laboratory studies on the influence of particle size,

utilizing samples which have been fractionated by the use of the Federal air classifier, indicate that fractions which average 5μ or 15μ in diameter are more efficient larvicides than fractions averaging 25μ in diameter. Since the copper arsenite, as prepared in the pilot plant, has been of uniformly fine particle size, it is believed that its superiority over paris green may be in part attributed to this physical property. Studies on the influence of dilution of larvicides indicate that paris green or copper arsenite may be diluted with soapstone as much as 1:19 without reducing the larvicidal efficiency. Attempts to determine the minimum lethal dose of paris green for fourth instar larvae indicate that this is less than 0.0000004 gm. An entirely satisfactory determination of this has not been possible. Copper arsenite has exhibited a marked larvicidal superiority over paris green for first instar anopheline larvae."

Studies on the concentration and distribution of paris-green-lime mixtures applied as anopheline larvicides, R. S. HOWARD, JR., and J. ANDREWS (*Amer. Jour. Trop. Med.*, 22 (1942), No. 3, pp. 283-293, figs. 3).—Report is made of an investigation conducted with a view to improving local paris green larviciding practice by relating its limitations to certain measurable or preventable conditions. The authors' findings suggest that improvements in ground dusting and efficiency may be expected from the use of (1) a diluent whose density and behavior in aerial suspension is comparable to that of paris green or (2) pure paris green assuming that equipment could be developed to apply uniformly a pound or less per acre. Their experience shows that it is difficult to obtain regular dust coverage with less than 3 lb. of dust per acre with equipment now available.

ANIMAL PRODUCTION

[Investigations in livestock production by the Idaho Station] (*Idaho Sta. Bul.* 244 (1942), pp. 5-8, 9-10, 15-17, 51-58).—Results are briefly reported by W. M. Beeson, D. W. Bolin, C. W. Hickman, D. E. Brady, G. C. Holm, P. J. Carlson, J. W. Pence, C. E. Lampman, J. N. Thompson, L. R. Berg, R. F. Johnson, and E. F. Rinehart on the phosphorus requirements and blood phosphorus of sheep with and without cottonseed cake, alfalfa, and oats; lack of response of sterile rams to ascorbic acid therapy; swine progeny testing shows differences in dressing percentage; Michels' grass seed unsatisfactory for fattening hogs; calculi in sheep not caused by vitamin A deficiency; sardine oil a good vitamin D supplement for poultry; activated sterols as vitamin D supplements for poultry; dried whey as a flush mash for poultry and a source of riboflavin; liberal use of oats for feathering quality, egg production, mortality, etc., in poultry; sugar beet tops, molasses, and beet pulp for lamb and steer feeding; phosphorus in lamb rations and beef by-product rations for steers; and studies of potatoes, corn, and sorghum for silage.

[Livestock feeding and production studies by the Indiana Station] (*Indiana Sta. Rpt.* 1941, pp. 42-45, 46-48, 91, 92-96, fig. 1).—Results are briefly reported by C. M. Vestal, C. L. Shrewsbury, C. Harper, F. N. Andrews, F. G. King, L. P. Doyle, A. L. Delez, E. Barrick, R. King, N. E. Weitkamp, J. R. Wiley, C. W. Carrick, R. E. Roberts, S. M. Hauge, E. L. Johnson, T. E. Henton, and I. D. Mayer of studies on the effect of fish meal and fish oil on the flavor of pork; the effect of hominy feed on the quality of pork; deficiencies in rations responsible for death losses in fall beef calves; the chemical and physical changes of beef and pork during freezing and storage; the role of fat in swine nutrition and the quality of pork; comparison of open-pollinated and hybrid corn for growing and fattening hogs; protein mixtures of meat and bone scrap and other materials, especially soybeans, for growing and fattening brood sows; comparison of Atlas sorgo and corn silage for fattening cattle; nonleguminous roughages and protein

supplements with alfalfa hay for breeding ewes in winter; cause for losses and shrinkage of market hogs; types and grades of market hogs and breeding quality of products; soybean meal for laying hens and growing and breeding turkeys; substitution of soybean meal and corn for bran and middlings for growth of chicks; wheat and oats as substitutes for corn in broiler rations; influence of increased and reduced amounts of protein in the growing ration of chicks; effect of electric lights upon the growth of young chicks; effect of ultraviolet irradiation on growing chicks and laying pullets; ad libitum and restricted grain and mash feeding of laying hens; and effect of temperature and ventilation on egg production.

[Animal nutrition investigations] (*Fed. Proc. [Fed. Amer. Soc. Expt. Biol.]*, 1 (1942), No. 1, pt. 2, pp. 70, 87-88, 99, 100, 107, 108-109, 117-118, 134, 137, 189, 191-192).—Abstracts are given of the following papers presented on animal nutrition before the annual meetings of the American Physiological Society and American Society of Biological Chemists: Studies on Absorption From the Rumen, by A. D. Rankin (p. 70) (Cornell Univ.); The Thiamin Requirement of the Albino Rat as Related to the Carbohydrate, Protein, and Fat of the Diet, by W. W. Wainio (pp. 87-88) (Pa. State Col.); Relation of Protein and Purine Metabolism in Pigeons and Rats, by F. W. Barnes and R. Schoenheimer (p. 99); The Utilization of Amino Acids for Growth in the Mouse, by C. D. Bauer and C. P. Berg (p. 100); Induced Hypoproteinememia and Vitamin C Excretion, by C. A. Baumann, J. B. Field, R. S. Overman, and K. P. Link (p. 100); The Effect of Sulfapyridine on Nicotinic Acid Metabolism, by C. A. Elvehjem, L. J. Teply, and A. E. Axelrod (pp. 108-109), and Intestinal Synthesis of Biotin and Growth of Rats on a Low-biotin Diet, by G. M. Shull and E. Nielsen (p. 134) (all Univ. Wis.); Synthesis of Amino Acids by the Chick Embryo, by F. A. Osonka and H. W. Titus (p. 107) (U. S. D. A.); Vitamin E and Muscle Degeneration in the Hamster, by O. B. Houchin (pp. 117-118); Influence of Alpha-tocopherol and Unsaturated Fatty Acids Upon the Utilization of Vitamin A, by W. C. Sherman (p. 134), and Biological and Chemical Studies Related to Choline Deficiency, by R. W. Engel (p. 189) (both Ala. Polytech. Inst.); Thiamin and Riboflavin Metabolism, by B. Sure and Z. Ford, Jr. (p. 137) (Univ. Ark.); and Some Nutritional Requirements of the Hamster, by J. I. Routh and O. B. Houchin (pp. 191-192).

Experimental herd management, K. A. WAGNON, H. R. GUILBERT, and G. H. HAFT (*California Sta. Bul.* 663 (1942), pp. 50-82, pls. 2, figs. 5).—Data are reported on the gains and grazing of pregnant cows and their calves on the San Joaquin Experimental Range, with and without supplemental feeding mainly of cottonseed cake and rolled barley to one group during the dry season, in comparison with a group receiving no supplemental feeding except under emergency conditions. These two groups were started with 33 2-year-old helpers each in 1935 with age naturally advancing to 1940 and others added in 1938. In each group animals were grazed at the rate of 1 to 9 acres, 1 to 14, and 1 to 18 acres. Because of the division of numbers, differences in lots, and seasonal variations, definite conclusions as to the effects on cattle and ranges were not drawn. In general, with the supplemental feeding the total calf crop at weaning was usually greater. Animals that had not received supplemental feed made the best gains during the subsequent pasturing season, but the possibility of finishing and marketing 450-500-lb. weaner calves or 800-900-lb. yearling feeders through supplemental feeding was indicated. Gains under close grazing were definitely less than those from light and moderate grazing. Observations on the grazing habits, salt lick locations, and analyses of forage samples were included. Apparently about 50 percent more acreage appeared to be required to carry cattle from August to February than from February to August.

Grazing investigations on the northern Great Plains, J. T. SARVIS. (Coop. U. S. D. A.). (North Dakota Sta. Bul. 308 (1941), pp. 110, figs. 37).—Continuous grazing with steers at the rate of 3, 5, 7, and 10 acres of native pasture per head with other groups rotated showed over a 25-yr. period that the variations in seasonal rainfall and climatic conditions were rather uniform over this period. About 25 percent of the vegetation should remain ungrazed at the close of the season. The 100-acre pasture in which there were 10 2-year-old steers provided a greater area than necessary for 5 mo. grazing. The average daily gains on the 100-acre pasture from 1916 to 1935 were 2.10 lb., as contrasted with 2.08, 1.87, and 1.47 lb. per head daily on the 10-, 7-, 5-, and 3-acre pastures. The pasture grazed at the rate of 7 acres per steer gave practically the same results as 10 acres per steer with continuous grazing, and the vegetation was not seriously affected over the period of years. In another group grazed at the rate of 5 acres for 2-year-old steers the pasture was overgrazed, and some of the plants were driven out prior to the drought of 1934 and 1936. The pasture grazed at the rate of 3 acres per head was sufficient to carry the steers for an average of 109 days. Gains were severely reduced and the vegetation suffered from overgrazing. A 70-acre pasture was grazed by deferred and rotation methods at an average rate of 1 2-year-old steer on approximately 5 acres with gains intermediate between those in the 100- and 70-acre pastures of continuous grazing. The real value of a system of deferred and rotation grazing appeared to be its aid in restoring an overgrazed area, but the continuous grazing ordinarily practiced on the smaller area for a limited time was not advantageous. The most prevalent and palatable grazing plants on the area throughout the period were furnished by blue grama followed in order by western wheatgrass, nigger wool or thread leaf sedge, needle-and-thread, and other grasses based on ability to withstand grazing and gains produced by the cattle. Certain of the grasses proved most satisfactory during portions of the season but did not prove as suitable as others throughout the year. Yearling steers replaced 2-year-olds in 1936-40, and indicated that yearlings consume about 60-65 percent of the forage required by 2-year-olds. Various grasses were especially useful for small cultivated pastures for emergency grazing and for early spring grazing before native range is ready for grazing. The chemical composition and amount of the grasses available for clipping on the different plats are tabulated for several species.

Either Alyce clover or lespedeza hay is good maintenance ration for beef cattle, H. W. BENNETT and S. P. CROCKETT (*Miss. Farm Res. [Mississippi Sta.], 5 (1942), No. 5, p. 7).*—Beef cows and steers were satisfactorily wintered in different years with Alyceclover and lespedeza as the hay crops.

Comparison of shock corn, crib corn, and corn silage on an acre basis for finishing two-year-old cattle, M. JACOB and H. R. DUNOAN (Tennessee Sta. Bul. 178 (1942), pp. 23, figs. 6).—From the standpoint of gain, quality of beef, and financial returns produced per acre by different types of corn average results obtained in 3 yr. were decidedly superior for steers fed for 150 days on corn silage ad libitum with a medium ration of cottonseed meal. Lesser amounts of cottonseed meal with and without legume hay, shock corn, or ground ear corn in place of corn silage were not as profitable. The acre beef yields were 877.2 lb. with corn silage fed with 4.98 lb. of cottonseed meal per steer daily, 793.2 lb. with corn silage fed with more limited cottonseed meal and legume hay rations, 722.4 lb. with corn silage and limited cottonseed meal, 555.7 lb. with shock corn, cottonseed meal, and legume hay, and 380.3 lb. for steers on corn-cob-shuck meal, cottonseed meal, and legume hay rations. The stover and ear corn were ground.

Kudzu hay compared with standard ration for beef calves, yearling heifers, cows, A. E. CULLISON and J. L. HOLMES (*Miss. Farm Res. [Mississippi Sta.], 5 (1942), No. 6, pp. 2, 7*).—Although beef calves in a 2-week test and beef cows in a 63-day feeding experiment lost weight with kudzu hay when fed as a part of the ration, a lot of beef heifers were wintered successfully over a 90-day period with kudzu hay. The heifers did not seem to relish the hay, but they came through the winter in a healthy and vigorous condition and were no less thrifty than heifers wintered on Dallis grass hay, sorghum silage, and cottonseed meal. Kudzu proved difficult in feeding because of the coarse stems, but it may serve as a feed for wintering heifers and beef cows when other feeds are too expensive or not available. A feed rack was improvised for feeding it. Chemical analyses of kudzu stems and leaves are included.

Effect of exercise on quality of beef, S. BULL and H. P. RUSK (*Illinois Sta. Bul. 488 (1942), pp. 105-120, figs. 2*).—Exercise had no effect on the toughness of beef and caused no significant difference in flavor or other factors of palatability. Two experiments were conducted. In the first four steers each walked on the treadmill for 123 days an average of 3.7 miles per day. A like number of steers walked in the second experiment 132 days for an average of 3.9 miles per day. Each exercised steer was paired with a comparable one unexercised, and feed consumption was restricted to that of the unexercised animal. To produce 100 lb. of gain lightly exercised steers required an average of 17 percent more concentrates, 10 percent more silage, and 10 percent more alfalfa hay than unexercised animals. With heavy exercise there were required 72 percent more concentrates and 9 percent more hay, but 4 percent less silage than was required by unexercised animals per unit of gain. Exercise had no effect on the development of any of the organs or the dressing percentage although heavy exercise increased dressing percentage by reducing the fill. The quality of beef was not influenced, although there was indication that heavy exercise decreased resistance to shearing, thus confirming the reductions in collagen noted by Mitchell and Hamilton (*E. S. R., 69, p. 700*).

The influence of nutrition on the reproduction of ewes, H. M. BRIGGS, A. E. DARLOW, L. E. HAWKINS, O. S. WILLHAM, and E. R. HAUSER (*Oklahoma Sta. Bul. 255 (1942), pp. 30*).—Flushing or increasing the feed available to ewes just prior to and during the breeding season was not found beneficial in a 9-yr. study. Observations were made on 150 ewes as to the breeding behavior and reproduction when fed submaintenance, maintenance, and rations causing an increase in ewe weight prior to breeding. The numbers per lot in each test were small, and the variations occurring in the results made differences in the number of lambs produced and the time and occurrence of first oestrous ascertained by variance analyses nonsignificant. The heat periods of the ewes on the low levels of nutrition were, however, lengthened. The effect of breed and age on reproductive behavior of ewes was nonsignificant. It was noted that the fertility of rams was low in June, July, and August. The improved nutrition did not result in more lambs or an earlier lamb crop.

Control of leafy spurge by sheep, E. A. HELGESON and J. H. LONGWELL (*North Dakota Sta. Bimo. Bul., 4 (1942), No. 5, pp. 10-12, figs. 2*).—Further studies of sheep grazing leafy spurge in 1940 and 1941 were similar to the results reported for 1937 and 1938 (*E. S. R., 82 p. 234*).

A lamb feeding trial at the Williston Substation, J. H. LONGWELL and W. H. HUBER (*North Dakota Sta. Bimo. Bul., 4 (1942), No. 5, pp. 16-18*).—Results of a lamb-feeding trial from December 6, 1941, to February 28, 1942 showed a high value for alfalfa hay when fed with corn, barley, and oats as a grain mixture. The average daily gains produced were 0.3 lb. Crested wheat-

grass was not eaten as well as alfalfa but when linseed meal supplemented the grain mixture average daily gains of 0.3 lb. were made.

The feed requirements of market hogs—A tentative feeding standard, E. W. CRAMPTON and G. C. ASHTON (*Sci. Agr.*, 22 (1942), No. 6, pp. 390-400, figs. 3).—The individual feed consumption and weights of 480 pigs from birth to 200 lb. live weight were analyzed on the basis of 14-day periods for consideration of hog feeding standards. The data were fitted for each period to the regression equation $Y = k - b_1 - (W)^{b_2} - b_3(G)$, wherein Y indicated the daily feed, $(W)^{b_2}$ the actual or 0.73 power of the weight, and (G) the daily gain. Regression equations were calculated for 30-60, 70-100, and over 110 lb. live weight. These results showed that if anything the choice in weight which most closely approached the observed data was obtained with the first power of the weight rather than the 0.73 power. A hog feeding standard is proposed for feed requirements of pigs from weaning to 100 lb. and 100-200 lb. in which b_1 in the equation equals 0.04 and b_2 equals 1.0. The small negative k value found was ignored. For practical purposes satisfactory values could be obtained by simplifying the equation to $k=2$, $b_1=0.02$, and $b_2=1.0$ lb.

Chick vitality as affected by breeding, F. P. JEFFREY (*New Jersey Stat. Hints to Poultrymen*, 29 (1942), No. 4, pp. 4, fig. 1).—Differences in the chick mortality to 20 weeks of age were noted in different breeds and strains of poultry over a period of years.

Growth of Barred Rock chickens, J. E. PARKER and B. J. MCSADDEN (*Tennessee Sta. Bul.* 180 (1942), pp. 8, figs. 3).—The weights at 4-week intervals of one strain of Barred Rock chicks from 0 to 32 weeks of age are presented. These results showed that both sexes increased periodically up to 12 weeks. The largest gains were made by both sexes from 9 to 12 weeks. After this age there were decreases in the gains except from 21 to 24 weeks for pullets and 25 to 26 weeks for cockerels. The maximum weights of pullets occurred during February and March when the pullets were 48-52 weeks of age. The weights did not seem to be correlated with pullet mortality during the first year.

Dubbing production-bred Single-Comb White Leghorns, C. M. BICE (*Hawaii Sta. Cir.* 20 (1942), pp. 8, figs. 5).—General directions are presented for dubbing White Leghorn cockerels and pullets, with data to show that the operation did not have a deleterious effect upon body weight or sexual maturity of cockerels or egg production or egg size in pullets. Dubbing combs of δ s with large combs also increased vigor.

Battery management of chicks and layers in Hawaii, C. M. BICE and B. A. TOWER (*Hawaii Sta. Cir.* 19 (1942), pp. 23, figs. 20).—A general description of battery breeding and management of the laying flock under Hawaiian conditions, with directions for the feeding and management of battery chicks and construction of battery brooders.

Poultry feeding and confinement rearing experiments, H. B. HINDS (*Arizona Sta. Bul.* 184 (1942), pp. [2]+20, figs. 2).—The results of three tests with poultry are briefly reported.

I. *The comparative nutritive value of certain locally produced poultry rations.*—Three tests of 11 mo. duration each in which White Leghorn pullets were fed rations made up of scratch and mash of corn, barley, and red milo, in comparison with a check ration of corn, oats, and wheat products indicated that feed consumption, egg production, and mortality were not greatly different. Thus locally produced grains may be used in poultry rations provided proper protein supplements are added.

II. *Feeding tests.*—Four-yr. tests of 11 mo. duration showed that a 14 percent protein diet intermittently fed moist and dry was satisfactory for egg production

by Leghorn pullets. Groups receiving liquid milk with red milo, barley, and wheat made nearly as good production, but the production was lower on a ration changed at monthly intervals according to the cost of ingredients. Supplementing the check ration with dehydrated carrots did not prove worth while on account of the excessive cost of the carrots.

III. Confinement rearing.—Comparisons of different methods of management of young chicks to 18 weeks of age showed that those raised in an outside run with a concrete floor were larger and the plumage was superior to that of those raised on wire floors with a wire porch. A group raised on a concrete floor with a sun porch was nearly equal to a group with outside runs, but the latter had the lowest mortality. During the 3-yr. period 656 chicks were started by each method. In the rate of growth the order in the 3-yr. tests to 18 weeks of age from heaviest to the lightest was outside run, concrete porch, and wire floor. The birds raised on the wire floor had rough and ragged plumage and the heaviest mortality. In another comparison with lots of 150 chicks each better growth was made by chicks started in colony houses than by other groups held for the first 2, 4, or 6 weeks in batteries and later transferred to colony houses. There was difficulty in getting battery-started chicks to use the colony brooders.

The utilization of casein and amide nitrogen by chickens, V. G. HELLER and R. PENQUITE. (*Okla. Acad. Sci. Proc.*, 21 (1941), pp. 85-86, figs. 2).—Although casein furnished an excellent source of protein for chick rations urea was practically worthless because of the lack of bacterial synthesis. See also a note by Ackerson et al. (*E. S. R.*, 84, p. 94).

Cottonseed meal, shrimp meal, soybean meal, meat scraps, for growing chicks, C. E. BARNETT and H. D. POLK (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 6, p. 8).—In two comparisons of protein sources for growing chicks in lots of 50 crossbreds each it was found necessary to supplement a ration of about 17 percent meat scrap with manganese sulfate to avoid slipped tendon. A ration without milk but which contained protein from soybean meal, cottonseed meal, and alfalfa meal produced the cheapest gains. Good gains were made to 9 weeks of age with dried skim milk, shrimp meal, soybean meal, and meat scrap. The poorest weights were recorded for chicks receiving a 22-percent cottonseed meal ration.

Wartime feeding of poultry, G. P. GOODEARL (*North Dakota Sta. Bimo. Bul.*, 4 (1942), No. 5, pp. 13-15).—A general discussion of the nutritive requirements of chickens and turkeys and wartime sources of essential materials.

Carotenoids of grass silage, W. BOLTON and R. H. COMMON (*Nature [London]*, 148 (1941), No. 3752, p. 373).—The ready isolation of a blue-green chromogen from the petrol ether solution of the carotenoids of grassland silage was thought to have a possible relation to the grass yolks in the eggs of hens fed on silage or early young pasture.

Inactivation of vitamin B₁ by raw fish, E. H. SPITZER, A. I. COOMBS, C. A. ELVENJEM, and W. WISNICKY. (*Univ. Wis.*). (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 1, pp. 376-379).—Data are presented which indicated that a typical B₁ avitaminosis can be produced in chicks by feeding 25 percent raw whole carp as experienced in fox feeding with a ration adequate in B₁. The occurrence of polyneuritis was prevented by cooking and water extraction of the carp or partially prevented by ether extraction or air drying. These conclusions were derived from feeding tests with 14 lots of 10 each of day-old chicks. Raw carp entrails seemed to be the most potent in the sources of destructive materials but cooking prevented the destruction of any of the thiamin. When the combination including 2.5 gm. of entrails and from 100 to 600 µg. of thiamin was used, destruction was prevented by cooking.

Biotin and scaly dermatosis of the chick, S. ANSBACHER and M. LANDY (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 1, pp. 3-5).—Biotin deficiency symptoms in the chick, as noted by Hegsted et al. (*E. S. R.*, 84, p. 803), were completely cured by the administration of crystalline biotin methyl ester and growth was stimulated, suggesting that the chick may be used for a quantitative biological assay of biotin.

Refrigerated brine sprays for cooling dressed poultry, M. H. SWEET and G. F. STEWART. (Iowa Expt. Sta.). (*U. S. Egg and Poultry Mag.*, 48 (1942), No. 5, pp. 261-265, 308-313, figs. 3).—By the use of liquid sprays it was found possible to reduce the time necessary for air cooling 30-40 percent. In these studies groups of poultry and turkeys were cooled in air after treatment with brine sprays at 20°, 21°, and 22° F. These results are in accord with those previously noted by Williams et al. (*E. S. R.*, 87, p. 141).

A bile depletion method to eliminate liver stain in stored dressed poultry, W. A. MAW and N. NIKOLAICZUK (*U. S. Egg and Poultry Mag.*, 48 (1942), No. 5, pp. 275-278).—The inclusion of 25 percent refined cottonseed oil in one or two preslaughter trough or individual feedings of broilers and roasters was effective in depleting the weights of the gall bladder and contents to such an extent that the extensive gall stain in storage was reduced materially. From a single feeding the gall bladder and contents weights of broilers was reduced over 50 percent. With one feeding the gall bladder and contents of roasters were reduced as much as 30 percent and about the same with feeding on the day of slaughter as well as the day before. The level of oil and the time interval between feeding and slaughter were important matters as regards the efficacy of the method. There were included in the study groups of 6-14 fowls each of different age and with different amounts varying from 10 to 33 percent of cottonseed meal in the ration. Some of the birds were stored up to 8 days at 32° F.

Egg storage: A selected bibliography, H. E. GORESLINE (*U. S. Dept. Agr., Bur. Agr. Chem. and Engin.*, 1941, pp. 14).—This bibliography consists of selected references covering the years 1890-1941, inclusive.

Turkeying-off sorghums and proso, W. O. WILSON and W. E. POLEY (*South Dakota Sta. Cir.* 38 (1942), pp. 7, figs. 4).—Three-yr. tests of turkeying-off Sooner milo, feterita, amber cane, and proso millet are presented using 95, 65, and 123 poults 9-10 weeks old per lot in the respective years. It would appear that birds harvesting their own grains use their feed about 80 percent as efficiently as controls receiving a ration of various grains and proteins which have given good results in other feeding experiments.

DAIRY FARMING—DAIRYING

[Dairy investigations in Idaho] (*Idaho Sta. Bul.* 244 (1942), pp. 11-14, 35).—Progress reports (*E. S. R.*, 85, p. 809) are presented for the following studies: The results attained through continuous use of proved sires in Holstein and Jersey herds over a period of 24 yr., methods of ensiling potatoes, and the relative efficiency of utilization of hay when fed once, twice, or three times daily to milking cows, by D. L. Fourt and F. C. Fountaine; stud bull associations as a means of providing the service of good dairy bulls for the small herd, by G. C. Anderson and Fourt; practices which have proved valuable in controlling mastitis, by Fourt, Fountaine, G. C. Holm, W. V. Halversen, and V. A. Cherrington; the danger involved in applying the Babcock test to cream containing sodium chloride and factors involved in the development of rancidity in Cheddar cheese, both by H. C. Hansen and R. S. Snyder; and factors responsible for the development of "wintry" flavor in butter, by Hansen and D. R. Theophilus.

[Investigations with dairy cattle and dairy products in Indiana] (*Indiana Sta. Rpt. 1941*, pp. 54-58).—Brief progress reports (E. S. R., 86, p. 80), by G. O. Mott, J. H. Hilton, J. W. Wilbur, R. J. Westfall, S. M. Hauge, P. R. Elliker, W. H. Brown, B. E. Horrall, W. F. Epple, J. C. Crane, V. C. Manhart, and K. C. Boxell, are presented for the following: Comparative returns secured from alfalfa-bromegrass v. bluegrass pastures for dairy cattle, the relative availability of carotene in rations for dairy cows, alfalfa-bromegrass silage v. corn silage for dairy cows, factors affecting mold growth in cream, the effect of storage conditions on the phosphatase reaction of butter, the value of soybean lecithoprotein as an emulsifier in ice cream, a study of the lecithin content of milk and its products, the character of Indiana butter from the standpoint of quality, the copper content of dairy products and its relation to the quality of the finished product, the relation between methods of separating cream from milk on the farm and the quality of cream marketed, and consumer preference for butter of different grades and characteristics.

Metabolism stalls, A. D. PRATT and C. W. HOLDAWAY. (Va. Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 4, pp. 293-295, fig. 1).—The arrangement and construction of metabolism stalls for cattle are described and illustrated.

Grass silage in wartime, H. A. HERMAN and A. C. RAGSDALE (*Missouri Sta. Cir. 234* (1942), pp. 4, fig. 1).—Three practical methods are outlined for making grass silage without the use of molasses or mineral acids as preservatives, including (1) the use of ground corn, corn-and-cob meal, or other cereal grains, (2) the use of no preservative but allowing the crop to wilt so that the moisture content is about 65 percent, and (3) the use of dry or green sugary crops, such as sorgo, corn fodder, or other dried roughage.

Feeding grass silage, C. B. BENDER (*New Jersey Sta. Bul. 695* (1942), pp. 8, fig. 1).—Practical recommendations are offered for the feeding of grass silage, both to milking cows and growing heifers. Repeated feeding trials gave evidence that rations containing molasses-grass silage or phosphoric acid-grass silage are practically equal in production value to rations containing corn silage when compared on a nutrient basis. Milk produced on rations containing grass silage was superior in flavor, color, and resistance to oxidized flavor development in comparison with milk produced on corn silage or beet pulp.

Mungbean hay and mungbean silage for milk production, A. H. KUEHLMAN (*Oklahoma Sta. Cir. 101* (1942), pp. [4]).—In this brief résumé of feeding experiments with milking cows it is reported that in two trials an average of 133 lb. of mung bean hay was required to replace 100 lb. of No. 1 alfalfa hay. In three trials with silage 100 lb. of alfalfa hay was replaced by 268 lb. of mung bean silage on the average. Precautions to be observed in making satisfactory hay or silage from mung beans are discussed.

Sorghum silage economical for dairy herd, J. S. MOORE (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 6, pp. 1, 7).

Hay crop silage, N. N. ALLEN and J. B. FITCH (*Minnesota Sta. Bul. 360* (1942), pp. 16, figs. 8).—General recommendations for making and feeding hay-crop silage and certain advantages and disadvantages of ensiling such crops are presented. The results of experiments with alfalfa and sweetclover silages, including lots ensiled alone and with various supplements, indicate that even those of high moisture content without preservatives were generally well preserved. "As judged by general observations on color, odor, and taste, it is doubtful if any lot would have been consistently chosen as superior to others." Palatability tests showed all legume silages to be less palatable than corn silage. Among the legume silages, those containing molasses, phosphoric acid, or ground corn consistently ranked relatively high in palatability.

Minerals in dairy cattle nutrition: A review, G. BOHSTEDT. (Univ. Wis.). (*Jour. Dairy Sci.*, 25 (1942), No. 5, pp. 441-458).—A concise review, citing 64 references to the literature.

Increased milk and milk fat production following the feeding of artificially formed thyroprotein (thyrolactin), E. P. REINEKE and C. W. TURNER. (Mo. Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 5, pp. 393-400, fig. 1).—Following earlier experiments (E. S. R., 86, p. 822) on the growth response of goats to iodinated milk proteins (thyrolactin), this product was fed to lactating cows and goats. When fed from 5 to 10 gm. daily, the goats in declining stages of lactation showed an average increase in milk production of 10.51 percent. Concurrently the heart rate was accelerated an average of 8.2 beats per minute. In 14 individual trials cows receiving from 50 to 100 gm. daily responded with an average increase in milk yield of 8.59 percent. In 6 cases where milk fat analyses were made there was an average increase of 6.77 percent in fat percentage and 13.9 percent in fat yield. In discussing the practical possibilities of using iodinated proteins the need for following tested methods in their preparation is emphasized (E. S. R., 87, p. 267).

Vitamin A and carotene requirements for the maintenance of adequate blood plasma vitamin A in the dairy calf, P. D. BOYER, P. H. PHILLIPS, N. S. LUNDQUIST, C. W. JENSEN, and I. W. RUPEL. (Wis. Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 5, pp. 433-440).—Guernsey and Holstein calves were used in these trials, which extended from the thirtieth to the three hundred and seventieth day of age. Three levels of vitamin A intake, designated as deficient, border line, and adequate, were employed. The blood plasma vitamin A values proved to be a more delicate measure of the state of vitamin A nutrition than either growth or blood carotene. Blood plasma vitamin A values from 7 γ to 8 γ per 100 cc. were border line, with values below this definitely inadequate and values of 10 γ or more entirely adequate. Blood plasma carotene levels which would maintain an adequate blood vitamin A were from 50 γ to 70 γ per 100 cc. for Holsteins but from 110 γ to 140 γ per 100 cc. for Guernseys, thus indicating distinct breed differences. The daily intake of vitamin A which would maintain deficient, border-line, and adequate concentrations of blood plasma vitamin A were approximately 6 γ , 12 γ , and 18 γ per kilogram of body weight, respectively. Carotene intakes required to maintain an adequate plasma vitamin A were approximately 75 γ per kilogram for Holsteins and 125 γ per kilogram for Guernseys.

Parathyroid glands and lactation in the rat, S. J. FOLLEY (*Nature [London]*, 147 (1941), No. 3737, p. 744).—Confirming the results of earlier experiments,⁵ it was found that removal of the thyroid gland and the associated parathyroids from female rats at the sixth day of lactation markedly suppressed subsequent lactation, as evidenced by the limited growth and high mortality of the nursing young. Rats subjected to the same operation, but subsequently injected with liberal doses of Para-thor-mone (Lilly), were significantly better in lactational performance, leading to the conclusion that the integrity of the parathyroid glands is essential for normal lactation.

Arrangement of the tissues by which the cow's udder is suspended, W. W. SWEET, P. C. UNDERWOOD, C. A. MATTHEWS, and R. R. GRAVES. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 65 (1942), No. 1, pp. 19-43, figs. 12).—The suspensory apparatus of the bovine udder was studied by embalming a cow in a standing position and dissecting away the various structures that serve to attach the udder in a suspended condition to the cow's body. Photographs show the appearance and arrangement of the tissues at each stage of dissection. An out-

⁵ *Jour. Physiol.*, 93 (1938), No. 4, pp. 401-412, figs. 4.

standing feature of the findings was the relatively small size and great tensile strength of the elastic sheets which form the median septum. This septum, which had a fanlike attachment to the udder surface, was capable of supporting the udder in a well-balanced position when all other supporting tissue was removed. The relatively small area of contact between the upper surface of the udder and the abdominal wall and the fact that much of the udder is located to the rear of the abdominal wall and does not follow its curvature emphasize the difficulty of accurately estimating udder-capacity in the living cow. Anatomical changes that may occur in an udder which has become pendulous or broken down are discussed.

The humoral nature of the factor causing the let down of milk, W. E. PETERSEN and T. M. LUDWICK. (Minn. Expt. Sta. et al.). (*Fed. Proc. [Fed. Amer. Soc. Expt. Biol.]*, 1 (1942), No. 1, pt. 2, pp. 66-67).—Following an earlier report that the oxytocic principle is active in the ejection of milk in the bovine (E. S. R., 85, p. 392), evidence was obtained through perfusion experiments with surviving mammary glands that the factor causing the let-down of milk is humoral in nature. Blood drawn from cows that had been stimulated to let down their milk was potent in this factor, whereas blood from cows that were not so stimulated had no effect. Blood from cows that were markedly excited did not cause a let-down of milk but had pronounced vasoconstricting properties causing a marked reduction in rate of blood flow. When blood was permitted to stand for $\frac{1}{2}$ hr. the humoral agent for the let down of milk was destroyed.

Effect of certain hormones and drugs on the perfused mammary gland, W. E. PETERSEN. (Minn. Expt. Sta. et al.). (*Soc. Expt. Biol. and Med. Proc.*, 50 (1942), No. 2, pp. 298-300).—In further perfusion experiments the effect of nine different hormones and drugs upon the blood flow and ejection of milk in the perfused mammary glands was determined by injecting the substances into the arterial blood as it entered the gland. Only Pitocin and acetylcholine caused complete evacuation of the milk from the gland, while pitressin, epinephrin, histamine, and acetyl- β -methylcholine caused partial ejection of the milk. Epinephrin and histamine were powerful vasoconstrictors and when administered in sufficient quantity completely stopped the blood flow. Pitocin, pitressin, and ergonovine also caused some vasoconstriction. Carbamylcholine and atropine caused a slight increase in blood flow but had no effect on the ejection of milk.

Dairy goat management, G. VAN DER NOOT (*New Jersey Stas. Cir.* 418 (1942), pp. 16, figs. 9).—Principal topics of discussion in this popular publication are selection of a breeding herd; the breeding, feeding, and management of the goat herd; treatment of common ailments; characteristics of goat's milk; and methods for preparing hard cheese and cottage cheese from goat's milk.

Ascorbic acid in goat's milk, blood, and tissues, M. S. RICHMOND, C. D. GRINNELLS, and G. H. SATTERFIELD (*North Carolina Sta. Tech. Bul.* 68 (1942), pp. 39, figs. 3).—A more detailed report of research previously noted (E. S. R., 85, p. 234).

Effect of inhaled substances on milk flavors, W. E. PETERSEN and J. G. BERRINGTON. (Minn. Expt. Sta. et al.). (*Jour. Dairy Sci.*, 25 (1942), No. 5, pp. 381-387).—Cows were forced to inhale for 2 hr. the odors from various substances tested, after which they were immediately removed to a separate barn and milked by machine. Samples of the complete milking were then judged independently by three judges for evidence of off-flavors. From the opinions of these judges it is concluded that inhalation of turpentine, paradichlorobenzene, camphor, or vanillin caused flavoring of the milk characteristic of

each of these compounds; inhalation of benzaldehyde, onions, and garlic caused a change in the flavor of the milk which was not characteristic of the compound; inhalation of odors from corn silage, alfalfa silage, and decomposing manure produced off-flavors in the milk; and inhalation of synthetic orchid or scrapings of Roquefort cheese produced no detectable off-flavors in milk.

Milk lipase and milk flavor, I. HLYNKA and E. G. HOOD (*Jour. Dairy Sci.*, 25 (1942), No. 5, pp. 389-392).—A total of 144 milk samples representing 51 different cows were included in this study by the Department of Agriculture, Ottawa. Surface tension of the milk was employed as a measure of lipolytic activity, observations being made in the morning and afternoon following collection of the sample from the evening milking. A coefficient of correlation of 0.23 was found to exist between surface tension and flavor, indicating that lipolysis may be responsible for off-flavors in milk even though they are not definitely recognized as rancid flavors.

The phosphatase test—extent of use in North America, L. H. BURGWALD. (Ohio State Univ.). (*Jour. Dairy Sci.*, 25 (1942), No. 4, pp. 285-291).—Returns secured from a questionnaire mailed to 454 milk control laboratories, including city, State, provincial, county, private, and milk plant laboratories, showed that a high percentage of those reporting are now utilizing the phosphatase test as a measure of pasteurization efficiency. The Scharer field test was used most commonly, followed in order by the Gilcreas and Davis modification, a combination of the Scharer field and laboratory tests, the Scharer laboratory test, a combination of the Scharer field and Gilcreas and Davis tests, and the original Kay and Graham test. Data on official pasteurization time and temperature, modification of the various tests, number of samples tested by each method, and percentage of positive reactions are summarized.

Bacteria in creamery well water, C. JENSEN (*North Dakota Sta. Bimo. Bul.*, 4 (1942), No. 5, pp. 18-19).—A study of the water supplies of 42 creameries revealed that all except 4 contained types of micro-organisms capable of causing decomposition of milk fats and proteins. Defects in butter most commonly resulting from the introduction of such bacteria in the wash water were butyric, cheesy, oily, stale, and tallowy. The defects occurred rapidly at 70° F. but more slowly at 40°, and generally developed more slowly in salted than in unsalted butter.

The Babcock test: A review of the literature, E. O. HERREID. (Vt. Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 4, pp. 335-370).—A comprehensive review, with 239 references to the literature.

The relationship of errors in the Babcock test to losses in cream plants, J. L. HILEMAN, K. K. RUSH, and C. MOSS (*Jour. Dairy Sci.*, 25 (1942), No. 5, pp. 373-379).—Based on the testing of a large number of milk and cream samples, data are presented to show that the percentage of butterfat as measured by the Babcock test is consistently higher than that determined by the Mojonnier test. Because the error in fat content by the Babcock method was proportionately greater in milk than in cream, an apparent loss in butterfat resulted when this test was applied to milk and to the cream separated from it. This loss increased with increasing fat content of the milk skimmed, but decreased with increasing fat content of the cream produced.

The carotenoid content of milk fat fractions, V. N. KRAKOVSKY. (Cornell Univ.). (*Jour. Dairy Sci.*, 25 (1942), No. 4, pp. 287-300, fig. 1).—Milk fat fractions obtained by fractional crystallization (E. S. R., 84, p. 666) were analyzed for carotene content (E. S. R., 82, p. 243). Carotenoid content was found to be inversely related to the melting points of the various fractions and directly related to their iodine numbers. The degree of oxidized flavor development in

the various fractions during the 2 years' storage at 4°–5° C. was inversely related to carotenoid content. It appeared that the antioxidative factors present in butterfat are concentrated in the liquid fraction. It is further suggested that the efficiency of absorption of carotene by an animal from its feed might be influenced by the degree of unsaturation of the fat content in the feed.

The curd number test: A method of testing the curdling qualities of milk, B. SPUR and I. J. WOLMAN (*Jour. Dairy Sci.*, 25 (1942), No. 5, pp. 409–425, figs. 8).—The proposed test consists in artificially curdling milk under rigidly controlled conditions and then hardening the curds in formalin, followed by drying. The dried curd particles are then sieved through a battery of three screens of $\frac{1}{2}$ -, $\frac{1}{10}$ -, and $\frac{1}{100}$ -in. mesh, and the curd masses thus obtained are weighed. By applying an empirically derived formula of a so-called a–b–c type to this weight data, a curd number is obtained which epitomizes the milk's curdling qualities. Various factors affecting the accuracy of results are discussed at length. The curd number was found in general to run parallel to curd tension, although broader in scope and with greater applicability to research.

The bacteriology of brick cheese, II, III, E. M. FOSTER, J. C. GAREY, and W. C. FRAZIER. (Wis. Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 4, pp. 313–321, 323–333).—Two additional reports are noted (E. S. R., 80, p. 826).

II. Comparison of washed-curd and conventional methods of manufacture.—Experimental lots of brick cheese were made by the conventional method except that the curd was subjected to varying intensities of washing between the cutting and dipping stage. A so-called mild wash consisting of adding 25 lb. of water per 100 lb. of milk, removing 50 lb. of whey, and replacing with 50 lb. of water was judged most effective. "After this treatment enough fermentable lactose remained in the curd to lower the pH to about 5.00–5.15 in cheese with a moisture content of 40–42 percent." Such washing had no appreciable effect on the rate of development of starter bacteria, although there was a slightly slower rate of acid formation in the washed-curd cheese. A starter containing a combination of *Streptococcus lactis* and *S. thermophilus* proved most desirable. When washing was applied to cheese from low-quality milk undesirable fermentation was more pronounced than in the conventional cheese, but when milk of good quality plus a mixed starter was used undesirable fermentations did not appear in the washed-curd cheese.

III. The bacteria involved in ripening.—Examination of 1,016 cultures isolated from brick cheese at different stages of ripening showed that *S. lactis* was a predominant organism throughout the ripening period when it was used as part or all of the starter. Its numbers increased to a maximum in the first few days and declined after 3 or 4 weeks. When *S. thermophilus* was used as the starter its numbers increased very rapidly during the first 12 hr., then decreased sharply after 1 or 2 weeks, and was seldom found in the later stages of ripening. Lactobacilli were common in raw milk cheese after 1 or 2 weeks, but were seldom present in cheese from pasteurized milk, *L. casei* occurring most frequently. A few cases of bitter flavor were attributed to excessive numbers of *S. liquefaciens*. *S. bovis* and *S. fecalis* were commonly present in cheese made from pasteurized milk. When pH of the cheese did not drop below 5.3 during the first 3 days of ripening, late gas formation by anaerobic spore formers generally occurred.

Preservation of cottage cheese, C. JENSEN (*North Dakota Sta. Bimo. Bul.*, 4 (1942), No. 5, pp. 19–20).—In an effort to develop methods for satisfactorily prolonging the storage period of cottage cheese, freshly made cottage cheese curds were held in brine solution varying from 0 to 5 percent salt for periods up to 14 days at 45° F. Those in 3- to 4-percent brine solution retained their fresh flavor and a desirable consistency over a 14-day period, while those in weaker brine solution or fresh water or in a dry state deteriorated quite rapidly.

The effect of high-temperature short-time forewarming of milk upon heat stability of its evaporated product, B. H. WEBB and R. W. BELL. (U. S. D. A.). (*Jour. Dairy Sci.*, 25 (1942), No. 4, pp. 301-311, figs. 4).—Control samples of milk forewarmed to 95° C. and experimental batches forewarmed over a range of temperatures from 101° to 165° C., with heating, holding, and cooling times of 4, 25, and 4 sec., respectively, were all evaporated to 26 percent total solids. A comparison of the evaporated milks indicated that while the relationship between high forewarming temperature and heat stability varied with different milks, stability was generally doubled and in some cases increased as much as six times that of the control milk. The optimum forewarming temperature for most milks fell between 120° and 140°. Milks forewarmed to produce excessively high stability were generally too thin, while those with too low stability were rough after sterilization. The use of optimum high forewarming temperature gave a greater increase in heat stability in the evaporated milk than could be attained through use of the optimum quantity of stabilizing salt to a normally forewarmed milk.

Curd strength of evaporated milk, J. C. MARQUARDT and D. W. DENNISTON. (N. Y. State Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 5, pp. 427-432, fig. 1).—Twenty-six samples of evaporated milk of known history representing individual plants in 22 different States were included in this study. The curd strength of the reconstituted evaporated milks ranged from 3 to 6 Hill units, which was markedly less than that of commercially homogenized milks and well within the standard for soft-curd milk adopted by the American Medical Association. When mixed with equal volumes of water, reconstituted evaporated milk did not lose its homogeneous properties when held at 4.5° C. for 18 hr.

The availability of the iron of cocoa and of iron-fortified cocoa mixtures, F. KINDER, W. S. MUELLER, and H. S. MITCHELL. (Mass. Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 5, pp. 401-408).—Results obtained in feeding trials with rats over a 6-week experimental period gave evidence that approximately two-thirds as much hemoglobin was regenerated from the iron of cocoa as from an equivalent amount supplied as ferric chloride. However, iron added to a cocoa mixture was completely available and the addition of 1.7 percent of pure tannic acid did not reduce the availability of iron added to a milk ration. Thus it appears that fortification of cocoa or chocolate milk with iron is warranted, since the factor which limited the availability of the iron of cocoa had no influence on added iron.

VETERINARY MEDICINE

[Work in animal pathology by the Idaho Station] (*Idaho Sta. Bul.* 244 (1942), pp. 10-11, 17, 29-31).—The work of the year (E. S. R., 85, p. 815) reported upon by G. C. Holm, W. M. Beeson, W. B. Ardrey, V. A. Cherrington, W. V. Hulverson, D. L. Fourt, and C. E. Lampman includes control of chronic swine erysipelas, swine brucellosis, prevention and control of bovine mastitis, pullorum disease in chicks, diagnoses of poultry diseases, and the reduction of poultry mortality by selective breeding.

[Work in animal pathology by the Indiana Station] (*Indiana Sta. Rpt.* 1941, pp. 92, 97-100).—The work of the year (E. S. R., 86, p. 87) reported upon by E. E. Schnetzler, S. E. Hartsel, J. F. Bullard, R. K. Waugh, J. H. Hilton, P. R. Elliker, B. E. Horrall, C. R. Donham, F. L. Walkey, L. P. Doyle, and A. L. Delez includes bactericidal agents of avian blood; the prevention and control of mastitis; potency and purity tests of anti-hog-cholera serum and virus and vaccines; diagnoses of animal diseases; fowl paralysis, leucosis, and neoplastic conditions;

Brucella abortus (strain 19) in mature cattle; brucellosis in bulls and in swine; abortion and sterility in herds free from Bang's disease reactors; and the hog cholera virus.

Percutaneous application of sulfanilamide in animals and men, B. ZONDEK, Y. M. BRONBERG, and B. SHAPIRO (*Soc. Expt. Biol. and Med. Proc.*, 50 (1942), No. 1, pp. 116-120).—It is concluded that the percutaneous use of sulfanilamide may serve as an auxiliary method of chemotherapeutic treatment in certain cases.

The effect of sulfanilylguanidine on *Brucella abortus* in vitro, T. H. GRAINGER, E. V. GIBSON, and E. P. CAMPBELL (*Jour. Bact.*, 43 (1942), No. 2, pp. 265-266).—A study made of the effect of sulfanilylguanidine on an avirulent strain of *B. abortus* is reported upon. The plating materials used to test the mixtures of drug and bacteria were beef-heart infusion glycerol agar and nutrient broth. It was found that concentrations of the drug as low as 0.025 percent showed inhibition of growth. The stronger concentrations of the drug likewise exerted a marked effect upon the growth of the organisms.

Studies on the allergic and antigenic activity of sonic filtrate of *Brucella abortus*, E. L. STUBBS and I. LIVE (*Amer. Jour. Vet. Res.*, 3 (1942), No. 7, pp. 146-153).—A review of the literature with references is followed by the results of experiments conducted, presented in detail in tables. "Sonic filtrate of *B. abortus* produced skin reactions in sensitized rabbits and guinea pigs. The degree of reaction seemed to depend upon the protein concentration in the filtrate. An intravenous injection of live *B. abortus* into rabbits produced the best skin sensitivity to sonic filtrate. Animals injected with live culture intraperitoneally and those injected with heated but not killed organisms intravenously were less uniformly sensitized, while a phenol-killed culture injected intravenously did not produce an allergic skin sensitivity. The groups of rabbits which received, respectively, intravenous and intraperitoneal injections of live culture had the highest agglutinative titers, the group injected intravenously with heated culture ranked second, and the group injected with phenol-killed culture ranked third. Precipitins and opsonins were also present in the blood serums of the injected animals. Intracutaneous injections of single doses of sonic filtrate into control rabbits and guinea pigs did not sensitize these animals to subsequent skin tests after 4, 7, 10, and 24 weeks. However, the intracutaneous inoculations stimulated the production of agglutinins. The initial agglutinative titer and the length of time it persisted depended upon the concentration of filtrate used."

Response of sulfonamide-fast pneumococci to penicillin, H. M. POWELL and W. A. JAMIESON (*Soc. Expt. Biol. and Med. Proc.*, 49 (1942), No. 3, pp. 387-389).—Comparative experiments conducted by the authors with penicillin and sulfapyridine in mouse infections with three types of pneumococci have shown penicillin to be an effective chemotherapeutic agent against both parent and sulfonamidefast pneumococci.

Effects of tyrothricin and actinomycin A upon bacteriophage and bacterial toxins and toxin-like substances, E. NETER (*Jour. Bact.*, 43 (1942), No. 1, pp. 10-11).

Vitamin A and its relationship to some of the commoner diseases of farm animals, N. S. BARON (*Vet. Rec.*, 54 (1942), No. 3, pp. 29-37).—Estimations were made of the vitamin A content of the livers of certain domestic animals, both in health and disease, the details being recorded for 105 sheep and lambs, 184 pigs, 16 cows, 29 calves, 32 fowl, and 3 foals, as well as 72 samples of ewes' milk. It was found that while the fetal lamb appears to store no vitamin A in its liver and to depend upon its mother's colostrum for its early supplies, the pig is born with a limited reserve. Evidence presented also suggests that the calf relies very largely upon colostrum for its initial supply of vitamin. Disease conditions in

which gastritis and enteritis are present and certain respiratory conditions (though not tuberculosis) appear to cause a lowering of the vitamin A reserve. In other diseases there seems to be little, if any, correlation between the vitamin A reserve and the disease process. The livers of tuberculous cows contained very much greater reserves of vitamin A than those of nonaffected animals. The details of the study are given in tables, and a list of 57 references to the literature is included.

Identification of selenium indicator species of *Astragalus* by germination tests. S. F. TRELEASE (*Science*, 95 (1942), No. 2478, pp. 656-657).

Some growth requirements of *Erysipelothrix* and *Listerella*. S. H. HUTNER and D. REGAN (*Jour. Bact.*, 43 (1942), No. 5, pp. 629-640, figs. 3).—Report is made of a study of the growth requirements of two strains of *E. rhusiopathiae* and one strain of *Listeria monocytogenes*, which led to the development for each of simple media allowing heavy growth. Growth of both organisms was measured by titration of acid production. Both *E. rhusiopathiae* and *L. monocytogenes* required one or more amino acids supplied as a casein or gelatin hydrolysate. All strains required riboflavin. *E. rhusiopathiae* required in addition oleic acid, which satisfied the serum requirement. The oleic acid was noninhibitory in the presence of adequate saponin. The occurrence and some of the properties of unidentified growth factors for both organisms are briefly described. Some applications of these findings are outlined.

Experimental transmission of St. Louis encephalitis virus by *Culex pipiens* Linnaeus. W. C. REEVES, W. M. HAMMON, and E. M. IZUMI. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 50 (1942), No. 1, pp. 125-128).—That certain species of *Culex* mosquitoes may act as vectors of the virus of St. Louis encephalitis is supported by the following evidence: "(1) In certain areas *Culex* mosquitoes have fitted into the epidemiological picture to the extent that several workers have stressed their probable importance as vectors. (2) Virus is available to mosquitoes in the blood of doves and a number of other species of experimentally infected vertebrates. Evidence of naturally acquired infection has been demonstrated in the serum of many vertebrate hosts. (3) Infected *C. tarsalis* have been collected in nature. (4) *C. pipiens* has been shown to act as an experimental vector, transmission having been demonstrated to occur between the fourth and the eleventh day after an infective meal. Virus persists in the mosquito for at least 13 days."

Studies on johnin. H. W. JOHNSON and B. F. COX. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 7, pp. 131-138).—Part 1 of this contribution (pp. 131-136), which deals with the comparative sensitivity of rabbits, guinea pigs, and chickens inoculated with *Mycobacterium paratuberculosis*, presents the results obtained from the use of mineral oil suspensions of this organism for sensitizing these animals, the details being given in six tables. Suspended in mineral oil, *M. paratuberculosis* failed to produce a satisfactory sensitization in rabbits when injected either subcutaneously or intraperitoneally; it failed to produce a uniform sensitization in guinea pigs when injected intraperitoneally. When suspended in mineral oil and injected subcutaneously in guinea pigs it produced a satisfactory initial sensitization only.

Part 2 (pp. 136-138) reports upon a proposed method of testing the potencies of johnins, the details also being given in tables. It is proposed that the term "potency titer" be applied to the highest dilution at which a johnin will elicit a satisfactory reaction in birds sensitized to this organism. An average reaction index of 1 was considered the minimum which indicated a satisfactory response. The system employed for the purpose of assigning potency titers to different lots of johnin is set forth in tables. A positive (+) in any dilution of johnin employed

indicates that the average reaction of the five birds tested with the dilution is one (1) or greater. A negative (—) in any dilution of Johnin indicates that the average reaction of the five birds tested with the dilution is nine-tenths or less.

Some observations on the pathology of pneumonia in the food-producing animals, R. F. LANGHAM, F. THORP, JR., R. T. INGLE, and L. B. SHOLL. (Mich. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 7, pp. 139-145, figs. 15).—A study of the pathology of 31 cases of broncho-pneumonia, including 9 bovine, 12 ovine, and 10 porcine, is reported. " β streptococci (Lancefield's group C) were isolated from 4 of the bovine lungs. In the ovine cases *Pasteurella ovi-septica* was isolated eight times. β streptococci three times, and Spray's diplococci four times. In the porcine cases *P. suilla* and β streptococci were each isolated four times. The gross pathology usually was confined to the apical and cardiac lobes, but it sometimes involved the diaphragmatic and intermediate lobes. The broncho-pneumonia appeared to begin as a bronchiolitis which soon spread to the adjacent alveoli, giving it a patchy appearance. The cellular exudate usually was dominated by polymorphonuclear leucocytes, but in 2 cases the dominant cells were mononuclear phagocytes. The interstitial tissues, pleura, and blood vessels occasionally showed various stages of inflammation. In the 13 subacute cases and 1 chronic case there was proliferation of fibroblasts and some fibrosis."

Two new *Salmonella* types with undescribed flagellar antigens, D. W. BEUNER and P. R. EDWARDS. (Ky. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 50 (1942), No. 1, pp. 174-175).—The authors report upon two new *Salmonella* types with undescribed flagellar antigens, each type being represented by a single strain isolated from the feces of normal human carriers. *S. tennessee*, from the feces of a normal carrier who was employed as a food handler in a fraternity house, a number of the occupants of which were affected with food poisoning, was represented by the antigenic formula VI, VII : z_{29} . The antigens of *S. simsbury* were characterized as I, III, XIX : z_{27} .

Frequency of occurrence of *Salmonella* species, S. BORNSTEIN, I. SAPHIRA, and L. STRAUSS (*Jour. Infect. Diseases*, 69 (1941), No. 1, pp. 59-64).—The types of *Salmonella* strains found among 280 examined during 20 mo. were: In man, *S. paratyphi* A, *S. paratyphi* B, *S. chester*, *S. derby*, *S. abortus equi*, *S. paratyphi* C, *S. choleraesuis*, *S. thompson*, *S. virchow*, *S. oranienburg*, *S. barcilly*, *S. montevideo*, *S. amersfoort*, *S. newport*, *S. bovis morbificans*, *S. typhi*, *S. panama*, *S. gize*, *S. anatum*, *S. poona*, and the recently described *S. wichita* and *S. havana*; in man and animals, *S. typhimurium*, *S. muenchen*, and *S. enteritidis*; in food-stuffs (dried eggs), *S. senftenberg*.

Sulfanilylguanidine in control of *Salmonella* infection and carrier state in mice, P. R. BEAMER (*Soc. Expt. Biol. and Med. Proc.*, 49 (1942), No. 3, pp. 418-421).—The findings in this study indicate that *Salmonella* infection in laboratory colonies of mice may be effectively reduced if carriers are isolated and treated with chemotherapy. The treatment of infected animals with sulfanilylguanidine resulted in a decrease of *Salmonella* organisms in stool cultures. It is pointed out that in those few instances where chemotherapy is not effective the mice may be sacrificed in order to decrease the sources of infection.

Active immunity in mice against *Trichinella spiralis*, J. T. CULBERTSON (*Jour. Parasitol.*, 28 (1942), No. 3, pp. 197-202).—The findings reported have shown that mice become partially immune to *T. spiralis* as a result of either prior infection with the parasite or vaccination with its antigens.

Passive transfer of immunity to *Trichinella spiralis* in the rat, J. T. CULBERTSON (*Jour. Parasitol.*, 28 (1942), No. 3, pp. 203-206).

A preliminary report of the effect of X-ray on trichinosis in the rat, R. F. HONESS. (Wyo. Expt. Sta.). (*Jour. Colo.-Wyo. Acad. Sci.*, 2 (1940),

No. 6, p. 44).—In a group of infested rats X-rayed, 800 r. was found to cause a reduction of about 26 percent of the 150 trichina that had been fed to each rat. In the group fed X-rayed trichina, 800 r. was found to cause a reduction of nearly 85 percent.

Animal inoculations with pure cultures of *Trichomonas vaginalis* and *Trichomonas foetus*, R. E. TRUSSELL and S. H. McNUTT. (Iowa State Col.). (*Jour. Infect. Diseases*, 69 (1941), No. 1, pp. 18–28).—In the experimental work reported “vaginal inoculations of *T. vaginalis* in bacteria-free culture were successful only in *Macacus rhesus* monkeys. This same strain has been used to produce vaginitis in humans. *T. foetus* could be implanted in cattle and for very brief periods in dogs. Sheep, swine, horse, goats, guinea pigs, rabbits, and cats could not be infected vaginally with either trichomonad. Oral inoculations with *T. vaginalis* in chickens, turkeys, mice, and pigeons were unsuccessful. *T. foetus* could not be implanted by the oral route in chickens, turkeys, and pigeons. Rectal inoculations of chickens and turkeys with *T. vaginalis* were unsuccessful, and *T. foetus* could not be implanted rectally in turkeys. Subcutaneous inoculations of both organisms in guinea pigs were without effect. Intraperitoneal inoculations of turkeys, guinea pigs, and mice with *T. foetus* gave negative results, as did similar inoculations of *T. vaginalis* in turkeys and guinea pigs. Intravenous inoculations of cattle, dogs, and rabbits with both organisms were without apparent effect. Intracranial inoculations of calves, guinea pigs, and rabbits were equally negative. Both *T. vaginalis* and *T. foetus* were successfully cultured in chick embryos, although this was more difficult with *T. vaginalis*.”

Bovine tubercle bacilli in sputum, M. BEATTIE and R. NICKWONGER (Amer. Rev. Tuberc., 45 (1942), No. 5, pp. 586–588; Ital. abs., p. 588).—Of 366 strains of *Mycobacterium tuberculosis* that were isolated from the sputum of persons in hospitals and sanitariums in various counties in California and classified for type by growth on culture media, none was identified as the bovine type.

Latent feline tularemia apparently responsible for a human infection, E. JUNGHEER. (Univ. Conn.). (*Jour. Bact.*, 43 (1942), No. 5, p. 643).

Spermatogenesis and oogenesis in *Haemonchus contortus*, a nematode worm parasitic in the fourth stomach of ruminant animals, W. L. THRELKELD and M. E. HENDERSON. (Va. A. and M. Col. et al.). (*Va. Acad. Sci. Proc.*, 1941, p. 172).

Bang's disease control, W. BINNS (*Farm and Home Sci. [Utah Sta.]*, 3 (1942), No. 2, pp. 9, 11, fig. 1).—The importance and means of eliminating Bang's disease from dairy herds are dealt with, and the Bang's disease vaccination program adopted in Utah is described.

Actinomycotic-like clubs associated with coccidioidal granuloma in cattle, J. TRAUM and O. W. SCHALM (6. Pacific Sci. Cong., Calif., 1939, Proc., vol. 5, pp. 873–876, figs. 4).—Observations which indicate that *Coccidioides immitis* may be included in the group of microbial agents capable of provoking club formation in granulomatous suppurating processes are presented.

Sporadic bovine encephalomyelitis, S. H. McNUTT (*North Amer. Vet.*, 23 (1942), No. 4, pp. 242–246).—A further account of the newly recognized disease of cattle first reported upon by the author in 1940 (E. S. R., 84, p. 528).

The diagnosis of Johne's disease of cattle by cultural methods, F. C. MINETT (*Jour. Pathol. and Bact.*, 54 (1942), No. 2, pp. 209–219).—This contribution refers to experiments on the reliability of methods which may be used for isolating the bacillus of Johne's disease from the intestinal mucosa or glands. The chief points dealt with are the preliminary treatment of infected material, the choice of culture medium, methods of seeding tubes, and the size and sealing of culture tubes.

Listerella infection in cattle, L. H. SCHWABE and H. E. BIESTER. (Iowa State Col.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 7, pp. 165-176, figs. 10).—Report is made of an investigation of a number of outbreaks of an infectious disease in cattle manifesting central nervous disturbances found to be caused by a small, motile, gram-positive organism belonging to the genus *Listeria*. Transmission experiments indicate that cattle are far more resistant to the disease than either sheep or swine. "The organism apparently loses its pathogenicity after repeated cultivation on artificial media. The virulence may be restored by serial passage through a series of laboratory animals. Infections of various degrees of intensity were reproduced under experimental condition. Fatal cases were obtained by intracranial inoculations in cattle. Intravenous inoculation in cattle resulted in a severe reaction of relatively short duration followed by complete recovery. Intracranial inoculation of the bovine strain proved fatal to the experimental swine. The intravenous inoculations produced less severe reactions followed by recovery. The disease transmitted to sheep by intracranial inoculation terminated fatally. The sheep inoculated intravenously experienced a severe reaction accompanied by a rise in temperature which was of short duration followed by complete recovery. Fatal infections were secured by intracranial inoculations in chickens. Intravenous inoculations in chickens produced no apparent reaction. The bovine strain of this organism is similar morphologically to that isolated from sheep and swine and possesses similar staining properties as well as cultural characteristics. Inoculation of animals with the cultures of the bovine strains produced agglutinins in the serums of most of them. These serums agglutinated antigens of both ovine and porcine strains. The reactions, however, were so variable and inconsistent that they can not be depended upon as a routine laboratory procedure."

The relation of leucemia and bovine lymphocytoma, W. W. THOMPSON and L. M. RODERICK. (Kans. State Col.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 7, pp. 159-165, figs. 6).—It is concluded that the term lymphocytoma is the most appropriate designation for the neoplastic process of animals primarily involving lymphoid cells and tissues. There is thought to be little justification for a more complicated nomenclature to supply a more descriptive terminology for variations in fundamentally the same malignant condition. Observations indicate, moreover, that lymphocytomatosis is probably the most common neoplasm of cattle, and that if adequate means of recognition are utilized it may be found to constitute a problem of economic significance. The neoplastic process is more or less regularly characterized by a varying degree of leucemia, while the differential white cell count quite constantly shows a large proportion of atypical lymphocytes in the circulating blood. Laboratory work indicates that a total white cell count and differential leucocytic count in cases of obscure bovine ailments usually will aid in diagnosing the condition. The pathology of the occasional cases of myelogenous leucemia is described.

Concise methods for the detection of streptococci of Lancefield's group B or C in milk samples, E. J. FOLEY (*Jour. Milk Technol.*, 5 (1942), No. 2, pp. 94-98).—Description is given of a laboratory method for the diagnosis of bovine mastitis caused by streptococci of Lancefield's group B or C by the use of Hotis tests and Edwards' broth modified by the addition of selective inhibitory agents. It is pointed out that the value of the tests described is emphasized by the recent finding of Minett (*E. S. R.*, 88, p. 247) that the study of incubated milk samples is the most suitable method of demonstrating *Streptococcus agalactiae*. The use of crystal violet to inhibit micrococci and of sodium aside to inhibit *Escherichia coli* greatly improves the Hotis test. The number of tubes suitable for prolonged incubation or further examination is increased. Typical

positive Hotis reactions develop in many positive samples. The significance of an acid cream line is enhanced as this change within 16 hours' incubation usually indicated streptococcus growth. The occurrence of growth of extraneous bacteria in broth transfers from incubated milk samples is reduced by the presence of 1/100,000 crystal violet in the modified Edwards' medium. By conducting several tests in practically one operation distinct advantages are obtained, and as there is a certain amount of overlapping in the efficiency of the diagnostic tests they tend to merge and confirm each other in the majority of instances. One need not rely alone on the reaction seen in the incubated milk sample since the nature of the streptococci can be quickly determined by serological methods. The results of one test complements the other.

Feeding as a contributory factor in the development of chronic mastitis, E. N. MOORE, H. O. HENDERSON, A. H. VAN LANDINGHAM, and C. E. WEAKLEY, JR. (W. Va. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 7, pp. 154-158).—Report is made of a study of 28 animals, conducted with a view to determining the effect of heavy corn feeding as a contributory factor in the development of mastitis, and with 16 animals to determine the effect of rate of feeding the grain ration. No appreciable difference was noted in the incidence or severity of mastitis between the experimental and control lots. Physical, biologic, and chemical tests demonstrated wide variation in the severity of mastitis among individuals, but not between the two groups. Thus it appears that no appreciable increase in the incidence or severity of mastitis occurred as a result of the kind of ration or the rate of grain feeding under the conditions of these experiments.

The role of disinfectants in the control of mastitis, C. S. BRYAN, C. W. DARBY, W. L. MALLMAN, and A. C. CORBETT. (Mich. Expt. Sta.). (*Jour. Milk Technol.*, 5 (1942), No. 2, pp. 77-85).—In the experiments conducted, the details of which are given in nine tables, soap solutions were found to be unsatisfactory germicidal agents inasmuch as many strains of streptococci, *Staphylococcus aureus*, and *Escherichia coli* were unaffected. Sulfonated alcohols exhibited germicidal properties comparable to soaps. Soaps and sulfonated alcohols are unsatisfactory agents for destroying the organism on the udder causing mastitis. Hypochlorite solutions containing 1 p. p. m. available chlorine killed α , β , and γ streptococci in less than 1 min. A fresh hypochlorite solution containing 200 p. p. m. available chlorine is recommended for the disinfection of cows' udders. Hypochlorite solutions, turbid from the introduction of organic matter, are unreliable disinfectants.

Bovine tuberculosis: Its incidence in bone, joint, and cervical lymph node lesions in Italy, P. F. DE GARA (*Amer. Rev. Tuberc.*, 45 (1942), No. 5, pp. 576-585; *Ital. abn.*, p. 583).—In the examination of 195 cases of extrapulmonary tuberculosis in northern Italy from 1934 to 1939, the bovine type of tubercle bacilli was found in 9.2 percent. Of these cases, 174 had tuberculous bone and joint lesions, 13 of which were caused by bacilli of the bovine type. The remaining 21 cases had cervical lymph node lesions; 5 of these were due to the bovine type. Bovine tuberculosis was observed in 40 percent of the children below 5 yr. of age, in 16.6 percent of those between the ages of 5 and 15 yr., and in 6.4 percent of the persons older than 15 yr. The importance of infected raw milk or of prolonged contact with infected cattle in the etiology of infection with bovine tubercle bacilli is discussed. The contribution is presented with a list of 46 references to the literature.

A study of Actinobacillus lignieresii from sheep affected with actinobacillosis, H. A. TURNICLIFF. (Mont. Expt. Sta. et al.). (*Jour. Infect. Diseases*, 69 (1941), No. 1, pp. 52-58).—In two outbreaks of actinobacillosis of sheep in Montana *A. lignieresii* was recovered. A bacteriological study made with

these strains included their biochemical properties, fermentation reactions, and antigenic relationship, and comparisons were made with cultures of *A. lignieresii* of bovine origin. *Bacterium purifaciens* (Christiansen) seems to correspond in all essential details to *A. lignieresii*, and in all probability they are the same organism.

The development of cobalt deficiency in sheep, J. E. BOWSTEAD, J. P. SACKVILLE, and R. D. SINCLAIR (*Sci. Agr.*, 22 (1942), No. 5, pp. 314-325, figs. 3).—The feeding tests here reported supplement earlier work (E. S. R., 82, p. 233).

Helminth parasites of sheep, W. L. THRELKELD. (Va. A. and M. Col.). (*Va. Acad. Sci. Proc.*, 1941, pp. 172-173).—A contribution based upon work noted (E. S. R., 85, p. 669).

John's disease of sheep, D. F. EVELETH, R. GIFFORD, and C. H. ANTHONY. (Ark. Expt. Sta.). (*Vet. Med.*, 37 (1942), No. 6, pp. 241-247, figs. 10).—In work in Arkansas a high percentage of sheep have reacted to the intradermic Johnin test. The authors have found it possible to demonstrate acidfast organisms in the intestinal mucosa of 15 of 24 reacting sheep. It is sometimes possible to demonstrate acidfast organisms in the intestinal mucosa of sheep that fail to react to Johnin. The interrelationship between the symptoms of ovine John's disease and parasitism is discussed and the possibility of interspecies transmission of John's disease considered. Preliminary studies have indicated that the usual symptoms of John's disease rarely if ever develop in the pig. Numerous "reactor" swine have been examined post mortem, and acidfast organisms have been demonstrated in the intestinal mucosa. The animals examined have never presented evidence of avian tuberculosis. At the present time the authors are inclined to regard John's disease-infected swine as possible dangerous carriers of the disease.

Stomach worm (*Haemonchus contortus*) infection in lambs and its relation to gastric hemorrhage and general pathology, J. S. ANDREWS. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 65 (1942), No. 1, pp. 1-18, pl. 1, figs. 8).—A study of *H. contortus* infection in 19 crossbred Hampshire-Southdown lambs from 2 to 8 mo. old, conducted at the Beltsville Research Center in 1933 and from 1936 to 1938, inclusive, is reported upon. In the course of this work from 2,000 to 181,000 infective larvae of *H. contortus* were administered to lambs in single and multiple doses. Although one dose of 35,000 larvae undoubtedly would have produced death in 1 lamb had this animal been allowed to die naturally, much larger total doses were not fatal when administered in small daily doses. This observation indicates the development of resistance to infection in the lambs receiving the multiple doses. The data show that *H. contortus* produced a severe and sometimes fatal anemia in sheep. Blood appeared in the feces from 6 to 10 days after infection. In the two cases which were fatal, blood was present in the feces until the death of the animals. In lambs recovering from the infection the anemia was negatively correlated with the number of worm eggs per gram of feces. In lambs dying before the worms matured anemia developed rapidly, but a positive diagnosis of the infection was impossible before autopsy owing to the absence of worm eggs in the feces. In two of the fatal cases no worm eggs were passed in the feces, whereas one of the nonfatal cases had an egg count of 24,800 eggs per gram of feces. Accordingly, there was no correlation between the number of eggs per gram of feces and the fatality of the infection.

The quantities of blood lost during a period of 10 days in 2 of the lambs that died were 1,492 and 2,380 cc., or 1.57 and 2.50 times, respectively, the original quantity of blood in the lambs, as calculated from the body weight of the animals. These quantities compared favorably with the 3,560 cc. of blood taken from the jugular vein of a healthy lamb over a period of 15 days, until approximately the

same degree of anemia had been produced. This volume of blood was about 2.5 times the original volume of blood in this lamb, as calculated from its body weight. That the anemia associated with *H. contortus* infection in sheep was due to gastric hemorrhage alone was further indicated by the normal icteric index, the presence of reticulocytes in the blood of the anemic lambs, and the gross pathology and histological findings.

Internal parasites of sheep, C. ELDER (*Missouri Sta. Bul.* 447 (1942), pp. 8, figs. 2).—A practical summary of information.

Neutralizing antibodies in the cerebrospinal fluid in relation to cerebral resistance to equine encephalomyelitis virus, I. M. MORGAN, R. W. SCHLESINGER, and P. K. OLITSKY (*Jour. Bact.*, 43 (1942), No. 1, pp. 83-84).

A large-scale serum-neutralization survey of certain vertebrates as part of an epidemiological study of encephalitis of the western equine and St. Louis types, W. M. HAMMON, H. W. LUNDY, J. A. GRAY, F. C. EVANS, F. BANG, and E. M. IZUMI. (Univ. Calif., Wash. State Col., U. S. D. A., et al.). (*Jour. Immunol.*, 43 (1942), No. 5, pp. 75-86).—Further investigations in the Yakima Valley, Wash., during the spring of 1941 (E. S. R., 86, pp. 385, 386; 87, p. 117) are reported. "From an irrigated western valley region, where both St. Louis and western equine encephalitis occur in annual epidemics, 576 sera representing 74 species were examined by means of the neutralization test for antibody against both viruses. Each of the viruses was neutralized by approximately 50 percent of the sera from domestic fowl and to a less extent by sera from domestic mammals. The sera from wild species from each group showed a significantly lower percentage of positives than those from the respective domestic groups. Only 8 percent of the sera from wild mammals possessed antibodies. No sampling error was found which would alter the significance of these differences. From 'control' areas, where encephalitis was not recognized, 132 sera, largely from domestic species, were tested. Only 1 was positive. This confirms the specificity of the neutralization test. In this valley the epidemiology of these two diseases appears to be parallel. It is concluded that many of these birds and mammals, principally the domestic fowl, probably serve as reservoirs for infection of mosquitoes. The percentage of susceptible horses which become infected is very high."

The findings suggest that in a region where encephalomyelitis has occurred previously a large percentage of the horses which have not been clinically ill have nevertheless been infected and have developed antibodies. The percentage of "immune" horses in Yakima approached 100 percent. This indicates that for some reason infection rates are higher among horses than other animals, and that when a new epizootic occurs the number of susceptibles is very limited, in fact limited almost entirely to a few of the 1- and 2-year-olds. It is readily understandable, therefore, that with a high infection rate among susceptibles and a few susceptibles available to start with that the horse epizootic burns out comparatively early in the season. In view of this fact, it is not necessary to postulate a separate vector for the horse, but that the one or principal vector bites horses very frequently. The present data on the feeding habits of *Culex tarsalis* are considered to be entirely compatible with this hypothesis (E. S. R., 86, p. 386).

A list is given of 24 references to the literature cited.

Infection of horses with St. Louis encephalitis virus, experimental and natural, W. M. HAMMON, B. N. CABLE, and E. M. IZUMI. (Univ. Calif.). (*Soc. Nupt. Biol. and Med. Proc.*, 49 (1942), No. 3, pp. 335-340).—In continuation of these studies (see above) it is shown that horses from many of the Western States and from Massachusetts have antibodies, in varying proportion, to the

St. Louis encephalitis virus. Inoculation in nonimmune horses by the subcutaneous, intranasal, or intracerebral routes of a St. Louis virus freshly isolated from mosquitoes failed to produce clinical disease. It did produce inapparent infection resulting in the presence of virus in the blood in two instances in which suitable tests were made, and in all four inoculated animals induced a high titer of serum antibody. It is concluded that in horses inapparent infection occurs frequently in many widely scattered areas of the United States.

Notes on susceptibility of the golden hamster (*Cricetus auratus*) to equine encephalomyelitis virus, M. S. SHAHAN and G. T. CREECH. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 7, pp. 193-194).—Experiments reported have shown the golden hamster to be susceptible to both western and eastern equine encephalomyelitis virus injected intracerebrally or subcutaneously. The pathology of the disease in hamsters corresponds to that found in guinea pigs.

Transmission of equine infectious anemia by the stablefly (*Stomoxys calcitrans*), the horsefly *Tabanus sulcifrons* (Macquart), and by injection of minute amounts of virus, C. D. STEIN, J. C. LOTZE, and L. O. MOTT. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 7, pp. 183-193, figs. 8).—Following a review of the literature on the transmission of infectious anemia by arthropods, report is made of experimental work which indicates that infection in a susceptible horse can be induced by the subcutaneous inoculation of 1 cc. of virus in 1:1,000 dilution, or by repeated pricking of the skin with a hypodermic needle contaminated with virus. It is pointed out that the findings on fly transmission of infectious anemia here reported confirm the earlier work by Scott (*E. S. R.*, 48, p. 283) and support the contention that blood-sucking flies probably play an important role in the dissemination of infectious anemia. Three positive cases of fly transmission are reported. Two susceptible horses developed infectious anemia 10 to 11 days after having been bitten by *T. sulcifrons* and one susceptible horse 24 days after being bitten by the stablefly. Conclusive evidence also was obtained that the mouth parts of horseflies subsequent to feeding on an infected horse contained virulent virus.

Neutralization studies of the viruses of influenza A, influenza B, and swine influenza with equine influenza convalescent serums, T. O. JONES and F. D. MAURER (*Amer. Jour. Vet. Res.*, 3 (1942), No. 7, pp. 179-182).—In studies of serums from horses convalescent from equine influenza, detailed in three tables, no significant increase in neutralizing capacity against the WS, Melbourne, and PR-8 strains of influenza A, swine-influenza virus, or the TM strain of influenza B virus was detected.

Occurrence in the horse of two parasites of cattle, *Ostertagia ostertagi* (Stiles, 1892) and *Cooperia oncophora* (Railliet, 1898), H. ROTH and N. O. CHRISTENSEN (*Jour. Parasitol.*, 28 (1942), No. 3, p. 245).—These unusual parasites, normally inhabiting the alimentary tract of ruminants, are reported as having been met with three times in the horse when a large number of horse stomachs and duodenum were examined.

Epithelial tumors of horses, R. A. RUNNELLS and E. A. BENBROOK. (Iowa State Col.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 7, pp. 176-179, fig. 1).—Of the 73 epithelial tumors of horses which form the basis of the report here presented, 7 were papillomas, 54 squamous-cell carcinomas, 2 adenomas, and 10 adenocarcinomas.

Some effects of cobalt and liver substance on blood building in dogs, D. V. FROST, E. H. SPITZER, C. A. ELVEHJEM and E. B. HART. (Wis. Expt. Sta.). (*Amer. Jour. Physiol.*, 134 (1941), No. 4, pp. 746-754, fig. 1).—The authors observed an inhibition of the normal hematopoietic response to iron and copper

feeding in dogs made anemic by hemorrhage and fed cobalt prior to the addition of iron and copper. Hematopoietic activity was resumed on the feeding of whole dry liver or liver extract. The compounds in liver which caused this profound hematopoietic response have not been determined. A temporary polycythemia was produced in adult dogs by feeding from 3 to 6 mg. of cobalt per kilogram of body weight in addition to the usual mineralized milk diets. High levels of cobalt had a toxic effect on young growing dogs and little apparent effect on the blood picture.

A note on the probability of error in the diagnosis of rabies by microscopic search for Negri bodies, S. R. DAMON and T. F. SELLERS (*Vet. Med.*, 37 (1942), No. 6, pp. 253-255).

Encephalitis (?) in red fox in southwestern Ohio, H. BEZDEK (*Jour. Mammal.*, 23 (1942), No. 1, p. 98).—Brief reference is made to a native red fox in Ohio apparently afflicted with encephalitis, examination of the brain for rabies having proved negative.

The role of coccidia as parasites of wild life, J. W. SCOTT. (Univ. Wyo.). (*Jour. Colo.-Wyo. Acad. Sci.*, 2 (1940), No. 6, p. 45).—This is an abstract of a contribution in which previous work relating to coccidiosis in wildlife is reviewed and information pertaining to coccidiosis among sage grouse in Wyoming is considered. Serious outbreaks of this affliction occurred in Wyoming in 1933 and 1939, with the heaviest losses, estimated at 15 to 25 percent, among young birds which began to die about the middle of July. See also a contribution by Honess on coccidia infesting the bighorn sheep in the State (*E. S. R.*, 87, p. 273).

Observations on a fungus skin disease of Iowa muskrats, P. L. ERRINGTON. (Iowa Expt. Sta. et al.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 7, pp. 195-201).—It was found during the summers of 1935, 1936, and 1938 that 9.6 percent of 364 litters of muskrats handled on or in the vicinity of Round Lake, a northwest Iowa marsh, suffered from skin disease due chiefly to *Trichophyton mentagrophytes*. Evidence from other localities, where less intensive studies of young animals were carried on between 1934 and 1940, suggests that the disease may be widespread, at least within the boundaries of the State. Only young muskrats less than 2 mo. old appeared visibly affected, infections being invariably fatal to those showing gross manifestations before the age of 2 weeks. Ninety-eight of 134 members of infected litters were recorded as contracting the ailment, and of the 98 individuals, 90 appear to have died. In general, incidence and severity of infection alike rose as the breeding season (mid-April to late August) of the muskrats progressed.

Causes of death of chickens: A review of a California study, H. L. WALSTER (*North Dakota Sta. Bimo. Bul.*, 4 (1942), No. 5, pp. 8-9).—This is a review of the work by Hoffman and Stover in California previously noted (*E. S. R.*, 87, p. 571). The most frequent causes of death (3 percent or more) for birds of all ages were coccidiosis 23.3 percent, colds and coryza 7.7, intestinal roundworms 6.0, paralysis 5.6, enteritis 5.3, pullorum disease 5.2, tumors 3.6, and ulceration (gizzard) 3.2 percent. The birds were classified in six age groups, the frequency determined by age groups being as follows: 4 weeks and under, 5 to 12 weeks, 3 to 6 mo., 7 to 12 mo., 1 to 2 yr., and 2 yr. and over. The study revealed that 64.4 percent of the causes of death were of birds less than 7 mo. old.

Diseases of brooder chicks, C. D. LEE. (Iowa State Col.). (*North Amer. Vet.*, 23 (1942), No. 4, pp. 259-264).

The effect of phenothiazine on the hemoglobin concentration of chickens, E. C. McCULLOCH and L. G. NICHOLSON. (Wash. Expt. Sta.). (*Vet. Med.*,

37 (1942), No. 6, pp. 248-252, fig. 1).—The work reported, details of which are given in three tables, indicates that the administration to chickens of the therapeutic dose of phenothiazine and 2, 5, and 10 times this amount does not significantly lower the hemoglobin concentration of the blood.

Preparation of living nuclei from hen erythrocytes, M. LASKOWSKI. (Minn. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 49 (1942), No. 3, pp. 354-356).

Isolation of filterable virus from chickens affected with "blue comb" disease, E. F. WALLER. (N. H. Expt. Sta.). (*Science*, 95 (1942), No. 2474, pp. 560-561).—Observations on an outbreak in two flocks at the New Hampshire Station of the affection reported upon by Jungherr and Levine (E. S. R., 86, p. 96), known as pullet disease, blue comb, "X" disease, etc., are reported. Many of the birds were found dead without having been observed to be sick; others died after an illness of only a few hours. From the blood stream of such acutely affected birds from both flocks a filterable agent was obtained that grows readily on the chorioallantoic membrane of chick embryos. One strain was carried through 56 transfers made at 72- or 96-hr. intervals and the other strain through 39 such transfers. A third strain obtained from the eggs of an infected flock is now in its seventh transfer. When the infected chorioallantoic membrane, embryo, or embryonic fluid is injected into susceptible chickens they, after 84 to 96 hr., become somewhat depressed and cyanotic. Death has not been produced by such an inoculation.

"A suspension of the feces and intestinal contents of experimentally infected birds is infective to other birds of the same age when given by way of the mouth. A bacterial-free filtrate of the feces is infective when injected intraperitoneally. Bacterial-free fecal filtrates are also capable of establishing the virus in incubating chick embryos. The virus is readily filterable through either or both the Seitz E-K 3 and the Chamberland-Pasteur L-3 filter."

Differential characters of two strains of *Clostridium botulinum*, type E: Action of toxins in chickens, E. L. HAZEN (*Soc. Expt. Biol. and Med. Proc.*, 50 (1942), No. 1, pp. 112-114).—Descriptions are given of the differential characters of two strains of *C. botulinum*, type E, one isolated from German canned sprats and the other from Nova Scotian smoked salmon. Culturally they can be differentiated by colony formation on horse blood agar plates. Agglutination and absorption tests indicate them to be of distinct serologic groups. Tests for toxigenic activity demonstrated, however, that the toxins were not identical. Subcutaneous injections of both toxins uniformly gave rise to symptoms characteristic of botulism in guinea pigs, mice, rabbits, and kittens. White Leghorn chickens were highly susceptible to the toxin of the salmon strain but not to that of the sprat strain. In chickens 4 to 12 weeks old, approximately 6 to 8 guinea pig median lethal doses of the salmon toxin gave rise to fatal botulism, while doses of the sprat toxin several hundred times as large failed to kill or induce symptoms of botulism. The sprat toxin was demonstrable in the blood and also in the excreta of some of the chickens 72 hr. after inoculation.

Ineffectiveness of cow urine in the control of *Eimeria tenella* infection in chickens, H. FISHER, C. INKSTER, and J. BIELY (*Amer. Jour. Vet. Res.*, 3 (1942), No. 7, pp. 221-224).—In determining the effect of cow urine and its constituents on the course and development of coccidiosis in chickens, several groups of chicks were inoculated with *E. tenella* at the rate of 120,000 sporulated oocysts per chick. The inoculated chicks were studied to determine the effects of (1) urine on growth, (2) urine on coccidiosis, (3) varying amounts of culture, (4) hydrolyzed and unhydrolyzed urine, (5) urine fractions, and (6) urea.

Favorable differences were not observed in the virulence of coccidiosis in the treated and control groups. It was thus established that cow urine, various fractions of the urine, and urea did not protect growing chicks against lethal doses of *E. tenella*.

Transmission of virus of infectious tracheitis in chicken by contaminated egg shell. I. J. KLIGLER and M. PEREK (*Soc. Expt. Biol. and Med. Proc.*, 49 (1942), No. 3, pp. 357-359).—Report is made on an infectious disease hitherto unobserved in Palestine which has been reported among chickens from different poultry farms. Its symptomatology resembles infectious laryngotracheitis, but it differs from this affection by its mild course, with absence of fatalities and of any noticeable effect on development. The disease is milder in young than in old chicks. Experiments demonstrated a virus to be transmitted on the surface of the eggshell.

Infection was most readily produced by dropping infected material into the trachea, also by intraperitoneal or intrathoracic inoculation. The incubation period varied with the age of chicks and the concentration of virus. One-week-old chicks showed the first symptoms of infection after 5 days; in chicks 2 weeks old, the incubation period was 9 to 24 days; in 6-8-week-old chicks the incubation period varied from 11 to 42 days. The infection spread quickly by contact. The time of exposure before appearance of symptoms (8-10-week chicks) ranged from 22 to 64 days. The virus could be demonstrated in the tracheal secretion in 1:1,000,000 in unfiltered and in 1:10,000 in filtered fluid.

A survey and study of spontaneous neoplastic diseases in chickens. C. OLSON, JR., and K. L. BULLIS (*Massachusetts Sta. Bul.* 391 (1942), pp. 56, pls. 12, fig. 1).—The results of a study contributing to the knowledge of the morphological characteristics of the various types of neoplasia and providing information on the relative incidence of the specific types are presented. They are based upon the histological examination of specimens received at the diagnostic laboratory and suspected of neoplastic disease at the time of necropsy. The collection included 384 cases of spontaneous neoplastic disease found in 365 chickens. An incidence rate of 12.9 percent for neoplastic disease was found in 2,304 chickens over 6 weeks of age that were examined in the laboratory. Twenty-five different kinds of neoplasms were found. Lymphocytoma was the most common and accounted for 55.5 percent of the 384 cases. Six other varieties (leiomyoma, embryonal nephroma, myelocytoma, leucosis, epithelioblastoma, and fibrosarcoma) accounted for 33 percent of the tumors. Each of the varieties of neoplasia is described, and the data are compiled for study. The incidence of neoplasia was studied in relation to various factors, such as age at necropsy, sex, seasonal occurrence, and breed. Each of these appeared to be of significance in one or more types of tumor. In some of the cases tentative diagnoses, based on macroscopic examination only, were later correlated with the final diagnoses in an effort to determine the accuracy of such tentative diagnoses. The results, together with sources of error, are discussed. The data on lymphocytoma provided a basis for a possible explanation of the different forms of this disease. Other neoplasms on which new information of significance was found were leiomyoma, neurogenic sarcoma, and carcinosarcoma. It may be concluded that spontaneous neoplastic disease in the chicken is relatively common and that, although lymphocytoma is the most common and causes the most loss, the other kinds are responsible for a significant share of the loss due to neoplasia.

A list of 29 references to the literature is included.

A large unilateral fibrosarcoma of the pectoral muscles of a fowl. E. P. SINGSEN and F. W. COOK. (Univ. N. C.). (*Poultry Sci.*, 21 (1942), No. 4, pp.

291-293, figs. 2).—Report is made of observations of a very large tumor which constituted 65.2 percent of the total weight of a young male bird. Grossly, it was firm to the touch, glistening, and mottled white, red, and yellow in color. Histologically it proved to be a fibrosarcoma.

An electrophoretic study of pullorum-agglutinating chicken serums, C. L. SAN CLEMENTE. (Mich. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 7, pp. 219-221, figs. 4).—An estimate was made of the electrophoretic mobilities and compositions of several pullorum-agglutinating chicken serums. The relative mobilities of the protein fractions of all samples were uniform, while the percentage concentrations of the protein fractions were relatively irregular for the doubtful and positive serums. The pullorum antibody is believed to be associated with the γ -fraction. The albumin concentration was decreased in serums of high titer.

A filtrable virus, the cause of a respiratory-nervous disorder of chickens, D. E. STOVER (*Amer. Jour. Vet. Res.*, 3 (1942), No. 7, pp. 207-213).—Report is made of the study of a respiratory nervous disorder of chickens, reported by Beach (*E. S. R.*, 84, p. 821), which has become increasingly important since its first appearance in northern California flocks early in 1940. Most of the affected birds were from 3 to 10 weeks of age, but some outbreaks were observed in younger chicks and in mature hens. "The respiratory phase of the disease was similar to infectious bronchitis, and it was difficult to differentiate between the two on the basis of symptomatology. It is probable that a flock may become affected with both diseases at the same time. Nervous symptoms of three general types usually were observed in each affected flock within a few days after the birds first began to show evidence of a respiratory disease. These were muscular incoordination involving particularly the neck and leg muscles, constant tremor of the body, and paralysis of the legs. The infective agent was present in the air sacs, lungs, and tracheas of the affected chickens and produced the disease in other chickens when inoculations were made intranasally, intratracheally, subcutaneously, or directly into the crop. The disease was transmitted by pen contact.

"Experiments have shown that infective material extracted from the air sacs, lungs, and trachea when suspended in physiologic salt solution and passed through Berkefeld V, N, or W filters produced the disease. These results demonstrated that the disease is caused by a filtrable virus. Studies showed that chickens refractory to infection with the virus of infectious bronchitis were susceptible to the virus of the respiratory nervous disorder. Chickens refractory to the respiratory nervous disorder were susceptible to infectious bronchitis in 50 percent of the cases tested. Chickens that were immune to the respiratory nervous disorder and to infectious bronchitis were shown to be susceptible to the virus of infectious laryngotracheitis and to coryza caused by *Hemophilus gallinarum*. The results of the cross-immunity experiments indicate that the virus of the respiratory nervous disorder is distinct from the virus of infectious bronchitis and from that of infectious laryngotracheitis."

The relationship between body temperature and genetic resistance to *Salmonella pullorum* in the fowl, J. C. SOHOLES and F. B. HURT ([*New York*] *Cornell Sta. Mem.* 244 (1942), pp. 35, figs. 10).—The results of a series of studies with Rhode Island Red chickens on the physiological basis for resistance of fowls to *S. pullorum* led to the conclusion that differences in body temperature are responsible for differences in susceptibility of young chicks to this organism. The supporting evidence is as follows: "(1) By brooding chicks at 28° C. their body temperatures were lowered by amounts ranging from 0.7° to 1.4° F. below the temperatures of control chicks brooded at 35° C. These differences were

statistically significant at all ages up to 8 days after hatching. (2) In a series of 8 experiments chicks thus chilled were consistently more susceptible to *S. pullorum* than were controls brooded at 35° C. when both classes were inoculated on the day after hatching. In uninoculated controls at 28° C. mortality was insignificant. (3) By injecting sodium amytal the mean body temperature of chicks was lowered by 8.4° F. Recovery followed gradually and was complete 4.5 hr. after treatment. (4) In chicks with their body temperatures thus temporarily lowered by sodium amytal susceptibility to *S. pullorum* was higher than in inoculated controls not given the drug. (5) By exposing chicks to a 60-w. carbon-filament lamp at a brooder temperature of 38° C. their body temperatures were raised by amounts ranging from 1.26° to 2.10° F. above their temperatures when brooded at 28° C. and from 0.63° to 1.34° F. above the temperatures of controls kept at 35° C. (6) In 10 different experiments the resistance of chicks (thus subjected to artificial fever) was consistently greater than that of untreated controls when both classes were inoculated with *S. pullorum* on the day after hatching. (7) The average body temperature of chicks following inoculation was from 0.2° to 1.1° F. higher than that of uninoculated controls, but was more variable because the temperatures did not rise in all chicks. Of 397 inoculated chicks, 48 percent attained in the first 8 days a temperature of 107° F., whereas of 80 uninoculated controls only 3.75 percent reached that temperature. (8) Chicks that attained a body temperature of 107° F. following inoculation were more resistant than were those that did not. Even among the chicks that died, those with high temperatures lived longer than did those without. (9) In three lots of chicks brooded at 28° C. and inoculated when 1 day old the mean daily body temperatures from 1 to 8 days of age were consistently higher in the chicks that survived than in those that died. (10) In chicks not inoculated with *S. pullorum* until they were 2 or 3 days of age the body temperatures of those that subsequently died after infection were significantly lower, even before inoculation, than the temperatures of those that survived after infection. (11) Among chicks from different dams those with mean familial body temperatures higher than the average were more resistant to *S. pullorum* than were those with familial temperatures below the average. The families were first differentiated according to the temperatures of uninfected chicks. In 5 later experiments with inoculated chicks, the resistance of the high-temperature families was consistently and significantly higher than that of the low-temperature families. (12) From 2 to 10 days of age the body temperatures of White Leghorn chicks (which, as a breed, are comparatively resistant to *S. pullorum*) were consistently higher than those of Rhode Island Red chicks (which are comparatively susceptible). Moreover, when samples of both breeds were brooded at 28° C. the White Leghorns were better able to maintain and raise their body temperatures than were the Rhode Island Reds. (13) The body temperatures in chicks of both breeds were found to rise fairly rapidly in the first 8 days after hatching, as does also resistance to *S. pullorum*."

From all the evidence presented, the authors consider it reasonably certain that high temperatures and resistance to *S. pullorum* are not associated merely by chance, but that either the high temperatures or the greater adaptability of the temperature-controlling mechanism which these temperatures indicate, or both together, are responsible for the increase in resistance to *S. pullorum* which accompanies them. This effect is not necessarily attributable to the direct action of high temperatures upon that organism; it might result from their acceleration of the processes whereby the invading bacteria are destroyed.

The pathogenicity of *Aerobacter aerogenes* and *Escherichia acidilactici* for turkeys and their response to the agglutination test for pullorum dis-

case, H. BUNYEA and A. D. MACDONALD. (U. S. D. A.). (*Poultry Sci.*, 21 (1942), No. 4, pp. 306-310).—Tests made of experimental antigens on a flock of breeding turkeys are reported. The findings have shown that some strains of *A. aerogenes* and of *E. acidii lactici* are pathogenic for turkeys and poults and may be responsible for a considerable young poult mortality. The fact that these organisms possess some cross-agglutinating ability in the presence of pullorum antiserum, and vice versa, suggests the possibility that the presence of these infections in a flock of turkeys might tend to complicate the interpretation of the pullorum test. The predilection of the infections for the ovaries suggests the possibility of egg transmission of the infections. No definite proof of this has been developed, however. Although poults experimentally inoculated with bovine strains of *E. acidii lactici* were not shown to be susceptible to infection with laboratory cultures of the bovine organisms, yet it is conceivably possible that under field conditions young turkeys ranging areas or inhabiting buildings contaminated with virulent calf scour infection might become infected thereby. The findings indicate that the mammalian strains used in these studies may have become attenuated by prolonged maintenance in the laboratory.

Further observations on a blood protozoan of turkeys transmitted by *Simulium nigroparvum* (Twinn), E. P. JOHNSON. (Va. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 7, pp. 214-218, figs. 6).—Report is made of studies conducted in continuation of those noted (E. S. R., 79, p. 687). "In histopathologic studies of tissues from 21 turkeys infected with *Leucocytozoon smithi* and killed 24 hr. to 12 days after the injections, schizogonous stages of this protozoan were not found. From continued observations it is concluded that the gametocytes of this protozoan as observed in the blood of affected turkeys occur in the plasma and not in any host cell. In a further study of turkeys which were infected with this parasite and in which numerous gametocytes could be demonstrated in the peripheral blood for several months, when kept screened away from flies for a year gametocytes did not recur in their blood, while in control turkeys exposed to flies, gametocytes did recur, indicating that asexual reproduction of the parasite did not take place in the turkey. The oocyst stage occurs in the stomach wall of *S. nigroparvum* and not on the wall, as do malaria organisms in the mosquito. From this work it appears that the life cycle of *L. smithi* as it occurs in turkeys and in *S. nigroparvum* is as follows: Macro- and micro-gametocytes are taken into the stomach of these blackflies while engorging on blood from infected turkeys. These develop into macro- and micro-gametes, respectively, and after fertilization the resulting zygote uncoils in the stomach of the fly to become a motile ookinete which finds its way into the stomach wall, where it rounds up to become an oocyst. The oocyst, after maturing, ruptures to release sporozoites, which find their way to the lumen of the salivary glands of the fly. When the infected flies bite turkeys the sporozoites enter the blood stream, where they develop in the plasma into gametocytes."

Course of infections with the 3H2 strain of *Plasmodium cathemerium* in canaries, H. BECKMAN (*Soc. Expt. Biol. and Med. Proc.*, 50 (1942), No. 1, p. 90).—The author has found the 3H2 strain of *P. cathemerium* to be very virulent when transmitted (exclusively) through the bite of infected northern house mosquitoes.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the Idaho Station] (*Idaho Sta. Bul.* 244 (1942), pp. 23-27).—These include studies of runoff and of the irrigation of potatoes with cold well and warmer canal waters, by H. Beresford,

M. R. Kulp, H. S. Riesbol, J. L. Toevs, and W. Watson; analysis of mechanized production of potatoes and beets and threshing various crops with a small combine, by N. B. Akesson and Beresford; the use of light in agriculture, by Akesson, Beresford, D. E. Brady, W. V. Halversen, and J. M. Raeder; farm frozen storage, by Beresford; and reduction in amount of cement required in concrete, by Beresford and W. R. Friberg.

[Agricultural engineering investigations by the Indiana Station]. (Partly coop. U. S. D. A. et al.). (*Indiana Sta. Rpt. 1941, pp. 21-30, 80-81, figs. 3*).—This report contains notes on a study of the suitability of earth stabilized with emulsified asphalt for farm building construction as applied to a poultry laying house, and poultry housing studies, both by I. D. Mayer and C. W. Carrick; atmospheric corrosion of wire and wire products, and factors entering into the storage of shelled corn with high moisture content in small wire-sided bins, both by Mayer; study of temperature, humidity, and air movement in a concrete dairy barn, by Mayer and J. H. Hilton; hydrologic studies and measurement of runoff from small watersheds, by R. B. Hickok, Mayer, H. Kohnke, and G. D. Scarseth; a study of the structural and economic factors involved in the use of plywood in hog houses and poultry houses, by Mayer, E. J. Kirsch, C. M. Vestal, J. H. Martin, and Carrick; studies with Purdue plow trash shields, and a study of a fertilizer attachment for plows, both by R. H. Wileman; investigations on weed control implements, by Wileman and O. C. Lee; seed corn drying investigations, by Wileman and A. J. Ullstrup; the use of electricity in brooding chicks, by T. E. Hinton, S. W. Hanners, and W. P. Albright; mechanical refrigeration of milk with units driven by gasoline engines and electric motors, by Hinton and R. L. Witz; use of mechanical refrigeration for cooling and holding eggs on the farm, by Hinton, Witz, and G. W. Newell; a study of the use and practicability of electric heat for warming drinking water for livestock, by Hinton, G. H. Foster, and C. F. Gobble; the use of electric heat in brooding early spring farrowed pigs, by Hinton, Foster, and C. M. Vestal; the development of portable driers for the dehydration of hay and grain, by W. Aitkenhead, Wileman, and Mayer; and power consumption and comparative costs of stationary and portable spraying and stationary v. portable spraying plants, by C. L. Burkholder and Hinton.

[Agricultural engineering investigations by the Puerto Rico Station] (*Puerto Rico Sta. Rpt. 1940, pp. 36-38, 93-97, figs. 4*).—The construction of split-bamboo fishing rods was found by J. K. Alvis and P. A. Folch to be an industrial possibility for Puerto Rico. A ditcher for use on sugarcane land was developed, and its first model worked satisfactorily in friable soils. Experimental essential-oil stills were completed, and an experimental solar drier effectively reduced the moisture content of bamboo wood.

Surface water supply of the United States, 1940, parts 9, 13, 14 (*U. S. Geol. Survey, Water-Supply Papers 899 (1941), pp. VI+294, pl. 1; 903 (1941), pp. VI+246, pl. 1; 904 (1941), pp. V+208, pl. 1*).—These papers record measurements of stream flow for the year ended September 30, 1940, No. 890 covering the Colorado River basin, No. 903 the Snake River basin, and No. 904 the Pacific slope basins in Oregon and lower Columbia River Basin.

Reduction of mineral content in water with organic zeolites, R. F. GOUDEY (*Amer. Soc. Civ. Engin. Proc., 68 (1942), No. 2, pp. 225-236, fig. 1*).—The development of improved organic zeolites for the removal of positive and negative ions, completely or in part, provides superior methods for softening water, reducing sodium content, removing excess alkalinity, lowering sulfates, or reducing chlorides to produce suitable water for domestic, irrigation, and industrial

uses, and in special cases where inconvenience, expense, or failure to secure an adequate working plan are involved. Although the costs of operation in the more aggravated cases may be relatively high, they are, in most cases, not prohibitive and are certain to be lower as increased production and availability of suitable materials develop. A quality comparable for many purposes with that of distilled water can be produced by treatment with organic zeolites.

The grease problem in sewage treatment, A. L. FALES and S. A. GREELY (*Amer. Soc. Civ. Engin. Proc.*, 68 (1942), No. 2, pp. 193-209, fig. 1).—The quantity of "grease" found in sewage by the present standard method of analysis is largely dependent upon which of the three standard solvents is used for extraction. Furthermore, the standard method of determination of grease in sewage has proved not entirely satisfactory in other ways. The following steps appear to be desirable: (1) Agreement upon what substances should be included in the term grease, (2) adoption of a standard method for determination of grease in sewage as thus defined, and (3) accumulation of data based upon this standard method.

A considerable proportion of the ether-soluble matter can be removed by sedimentation and plain skimming. A somewhat larger proportion can be removed if the sewage is aerated prior to sedimentation and skimming. Aero-chlorination prior to sedimentation and skimming accomplishes a still larger removal of grease. At present, however, available operating data are insufficient to form a basis for a sound conclusion as to the value of preaeration and of aero-chlorination in the over-all removal of grease from sewage.

Reduction of irrigation water losses, O. W. ISRAELSEN (*Farm and Home Sci. [Utah Sta.]*, 3 (1942), No. 2, pp. 6-7, figs. 4).—Of conveyance losses, seepage is the greatest and probably cannot be entirely prevented. The points of greatest seepage can be located, however, and the ditches lined with clay or the like at these points. Transpiration losses through vegetation along the canal bank and vegetative or other obstructions in the canals can be dealt with more promptly. Irrigating on the basis of examination of the soil to ascertain actual need rather than on that of the "watering turn," which wastes such water as is applied when the soil is already wet, could save much water. The best irrigation practices are considered seldom to store in the soil root zone more than 75 percent of the water delivered to the farm. The major cause of low water-application efficiencies is the application of excessive depths of water in single irrigations. A depth of 6 in. is usually quite enough, and on shallow soils it is too much. Careful control of the size of stream, avoiding excessively long runs, frequent transfer of water from one plat to another, careful inspection of depth of water penetration, use of runoff of high land to irrigate lower lands, or better still, prevention of runoff completely are some of the means by which irrigators can increase water-application efficiencies. Other important measures are to avoid runs of 660 ft. or longer, to apply the water at a rate greater than the rate of infiltration into the soil, to avoid land slopes of 3 percent and higher in the direction of the flow of the irrigation stream, not to let the water concentrate into large streams on parts of the farm and thereby cause erosion and gullyng, to measure the stream or get the water master to measure it, and to keep records of the depth of water applied.

1941 Supplement to A. S. T. M. Standards, including tentative standards.—II, Nonmetallic materials—constructional (*Philadelphia: Amer. Soc. Testing Mater.*, [1941], pt. 2, pp. XIV+427, figs. [55]).—This second supplement to part 2 of the 1939 A. S. T. M. Standards contains the 39 newly adopted and 37 revised standards and the 15 new and 35 revised tentative standards in the nonmetallic constructional materials field that have been accepted since the appearance of the first supplement, issued in November 1940.

The Utah snowmobile: This machine provides power transportation over snow-covered areas and may be of use to the Army for such purposes, G. D. CLYDE (*Farm and Home Sci. [Utah Sta.]*, 3 (1942), No. 2, p. 5, figs. 3).—This device is provided with a split endless track running over six rubber tires, the middle set of wheels being somewhat lower than the other two pairs so that the machine tends to pivot on the middle pair. Steering is accomplished by means of a small runner outrigger in front of the machine and operated by the steering wheel in the cab. In snow survey work the machine carried 11 men and their equipment weighing about 1,500 lb. a round trip of about 12 miles in about 3 hours' driving time over a course at elevation 8,250 ft. and grade which, in some instances, reaches 25 percent. The snow was soft in the timber and crusted in the open.

The total area of the tracks is approximately 32 sq. ft., and the maximum weight of the equipment with its load, exclusive of that carried as the guiding runners, is about 2,000 lb. This equipment can therefore be operated on very light snow as the weight is less than 0.5 lb. per square foot. In very loose soft snow the tracks settled as much as 20 in., but no stalling of the motor occurred. The sled was powered by a 65-hp. Chevrolet motor and a 1.5-ton rear end. The transmission was geared for a compound low speed, which gave ample power under the most adverse conditions. It is believed that this type of equipment will solve the problem of power transportation over snow-covered areas and should be of greater interest to the Army as well as irrigation, power, and municipal water users.

Adapting horse-drawn mowers to tractor power, L. E. HIGHTOWER (*Missouri Sta. Cir.* 217 (1941), pp. 4, figs. 5).—The author notes that the mower attached to the tractor should not be hitched directly to the end of a stub tongue. The brace bar beneath the frame extends downward at an angle, and in heavy cutting an upward thrust is produced. This tends to lift the weight of the mower frame off the wheels and thereby cause slippage. A drawing shows an arrangement which permits the mower to be pulled from the regular doubletree hitch. About one-half the force required to pull the mower is applied, through the draft rod, to the yoke of the cutter bar. This type of hitch allows much heavier cutting to be done without adding weight to the mower to provide traction. Square turns are possible if the regular tractor drawbar is extended backward about 18–20 in. in a manner illustrated. The tractor must be turned very short just as the rear tractor wheel clears the corner of the land. It may be necessary to use the right wheel brake. It is not necessary to stop the tractor, and it is usually not necessary to lift the cutter bar on square corners. Some safety device should be provided in the hitch unless the operator is sure the cutter bar will encounter no obstruction. Figures show one very simple type of safety device which consists of a small rivet or nail which shears and allows the drawbar extension to slide through the clamps which hold it to the tractor drawbar. A satisfactory arrangement for lifting the cutter bar from the tractor seat is illustrated.

Plow adjustment and operation, M. M. JONES and L. E. HIGHTOWER (*Missouri Sta. Cir.* 232 (1942), pp. 23, figs. 30).—The authors describe and illustrate sharpening of plowshares—the chilled iron type by grinding, the steel by heating and hammering—to restore down suction and side suction, give brief directions for hardening soft-center shares, and mention the hard-surfacing of steel shares by adding suitable material to the points and cutting edges with the aid of the welding torch. With respect to hitching for minimum draft they discuss and illustrate center of resistance and the importance of so hitching as to pull straight ahead from this point. Hitching adjustments for tractor plows are

taken up in detail with numerous diagrams. Other main topics are rear wheel adjustments, coulters, walking plows, and horse-drawn riding plows. General suggestions and hints on plow adjustment and operation conclude the treatment.

Spray machinery for home orchards, gardens, and truck crops, T. E. ASHLEY (*Mississippi Sta. Cir. 106 (1942), pp. 18, figs. 15*).—The author describes various commercial types of hand- and power-operated sprayers; gives details of the construction and operation of a hand-pump barrel sprayer converted for $\frac{1}{2}$ hp. gasoline motor drive, of which set-up a similar description has previously been published (E. S. R., 82, p. 263), together with directions for making a hemicylindrical horizontal sprayer tank; takes up nozzles for sprayers; briefly notes dusting equipment and its use; and adds some discussion of spraying schedules for various fruits.

A new castor-bean sheller, H. A. ARNOLD and M. A. SHARP (*Tennessee Sta. Bul. 179 (1942), pp. 12, figs. 7*).—The authors redescribe a device already reviewed elsewhere (E. S. R., 87, p. 125).

Dairy engineering, A. W. FARRALL (*New York: John Wiley & Sons; London: Chapman & Hall, 1942, pp. XV+405, figs. 190*).—This treatment of the subject is directed primarily to the operator and to the student without technical engineering training. Material has been drawn from the author's experience as a teacher of dairy engineering and from his research on dairy machinery in a large dairy-equipment manufacturing company as well as from previously published data. The contents are: Physical and chemical properties of milk; simple mechanical principles; power transmission; electrical power and equipment; hydraulics and pumping; heat measurement, transfer and control; steam and its use in the dairy; principles of refrigeration; insulation and cold storage rooms; heaters—coolers and heat-exchange equipment; ice cream freezing equipment; homogenizers; pasteurizing equipment; evaporating and drying equipment; can washing and sterilizing equipment; bottle washers and fillers; cream and butter handling equipment; cheese and casein plant equipment; equipment maintenance; pipe, pipe fittings, fitting, and soldering; and dairy plant design, layout, and utilization. An appendix, consisting of numerical data in common use, some physical constants of metals and other materials, and other physical data likely to be of use in dairying applications of refrigeration engineering, electrical power, etc., is also included.

"Gascolgne" auto-releaser milking plant, E. H. LAMB and F. H. JORDAN ([*Gt. Brit.*] *Min. Agr. and Fisheries, Agr. Mach. Testing Com. Certif. and Rpt., 73 (1942), pp. [4]+10, figs. 2*).—This report covers the performance of a complete set-up of milking equipment of four stalls and a building provided for the tests. The trial was continued through 15 mo. with generally very satisfactory results. The special feature of the equipment, the "auto-releaser", consisted essentially of a metal cylinder counterpoised, when empty, in the horizontal position, but tipping to a position about 30° from the horizontal after filling with milk. The tipping operated means for shutting off the flow of milk and the vacuum lines from the cylinder and for opening a large diaphragm valve at the lowered end of the tipped cylinder so that its contents were emptied into a receiving vat. The counterpoise then returned the cylinder to the horizontal position, completing the cycle of movements by reopening the milk flow and vacuum line.

The over-all report is that the lay-out of the plant is compact, labor-saving, convenient, and gives reasonable comfort for the cows. Under the conditions of the test the plant gave generally satisfactory results. Its general mechanical efficiency was good.

Air conditioning for houses in California, H. S. GORDON and R. L. PERRY (*California Sta. Cir. 351 (1942)*, pp. 48, figs. 13).—The subject matter is separated into the four general divisions (1) the physiological principles of air conditioning and the optimum conditions desired, (2) the loads and requirements to be satisfied (heating and cooling loads which will be required for different climatic and internal conditions for various types of building construction and the requirements of air movement, purity, and humidity), (3) fulfillment of air conditioning requirements, and (4) equipment for comfort cooling and air conditioning. The last-named division takes up attic fans for ventilation and night air cooling, evaporative cooling, cooling with well water and with ice, complete air-conditioning equipment, cost of air-conditioning equipment, and unusual applications (the final subtopic indicating the general principles of reverse-cycle heating and of panel heating and cooling). The general treatment is nontechnical, and a glossary of the more technical terms employed is appended.

Keeping your house in repair, A. F. COLLINS (*New York and London: D. Appleton-Century Co., 1941*, pp. XVI+314, figs. 121).—The author states that this book was written "for the man of moderate means who owns his house and who would rather keep it in repair himself than to suffer the slings and arrows that are his lot when he hires the average mechanic to do the job for him." Practical directions for selecting the most suitable tools and materials and for making both minor and major repairs and renovations are given, the following being the specific subjects covered: Making carpentry repairs, making roof repairs, masonry and plastering repairs, making stucco and concrete repairs, painting the outside of your house, finishing the inside of your house, papering the rooms of your house, making glazing repairs, repairing the plumbing system, repairing your heating plant, repairing the electric installation, and repairing builder's hardware. Chemical formulas having almost no relation to the actual chemical composition of the compounds named appear on pages 115 and 128.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics by the Idaho Station, 1941] (*Idaho Sta. Bul. 244 (1942)*, pp. 27-29, 50).—In addition to findings previously noted, there are included a brief statement by N. Nybrotten and P. A. Eke based on interviews with 180 settlers as to the need for capital and credit by settlers on the raw lands in the Black Canyon irrigation project in Canyon and Payette Counties; findings by Nybrotten as to the relation of wheat yields to selling values of land in the Palouse area; a brief statement by L. Fenske as to the cost per acre of operation and management, the costs per unit of grazing and the carrying capacity, etc., of improved pastures of different kinds; a brief statement of findings by Eke and R. Brown as to prices paid for butterfat and cream in Lewiston, Idaho, Spokane and Seattle, Wash., and Portland, Oreg.; and causes for cull grades of potatoes, by J. E. Kraus and J. L. Toevs.

[Investigations in agricultural economics and farm management by the Indiana Station, 1941]. (Partly coop. U. S. D. A. et al.). (*Indiana Sta. Rpt. 1941*, pp. 48, 67-68, 69-73, 87, 96-97, fig. 1).—In addition to findings previously noted, brief statements are included as to the following lines of work and findings: Livestock marketing from farm to processor, by J. R. Wiley, T. K. Cowden, and D. L. Henry; size of farms in central Indiana and costs of operating tractors, both by J. C. Bottum; rehabilitation farms and cost of production of tobacco, both by F. V. Smith; costs and practices in producing grains and sod crops, by Bottum, L. E. Slater, G. P. Walker, and T. M. Bushnell; economics of poultry production, by E. C. Young, J. W. Oberholtzer, and E. R. Menefee;

cost of keeping dairy sires in northwestern Indiana, by L. S. Robertson, Slater, V. C. Manhart, and G. A. Williams; marketing dairy products, by Cowden and C. M. Hardin; farm tenure during changing price levels, Indiana farm tenure by type-of-farming areas, and landlord-tenant compensation, all by O. G. Lloyd and H. S. Morine, Jr.; relation of slope and erosion to farming adjustments and land use on farms in the southern Indiana limestone area, by Smith; farm labor, by Young, Robertson, and B. R. Bookhout; a historical analysis of farm prices in Indiana, by E. L. Butz and H. J. Houk; selling tomatoes on a graded basis, by F. C. Gaylord and K. I. Fawcett; a study of the retail egg markets in Indiana, by Menefee and Cowden; and Federal-State egg inspection service, by Menefee and G. W. Newell.

[Investigations in agricultural economics by the Mississippi Station] (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 5, pp. 1, 7, 8).—Included are two articles by M. Guin on High Prices Reflected in Higher Farm Income (pp. 1, 7) and Income and Profit Increase on Truck Farms (p. 8).

[Investigations in agricultural economics by the North Dakota Station] (*North Dakota Sta. Btmo. Bul.*, 4 (1942), No. 5, pp. 21-23, figs. 2).—Included are articles by W. L. Ettesvold on (1) The War Presents Problems in Livestock Marketing (pp. 21-22), with charts showing how different kinds of livestock were moved from farms in North Dakota in 1940 and the average size of sales, and (2) North Dakota Farm Prices (pp. 22-23), showing the average prices received by farmers for 14 commodities on April 15, 1942, with comparisons with earlier dates.

Current Farm Economics, [June 1942] (*Oklahoma Sta., Our. Farm Econ.*, 15 (1942), No. 3, pp. 73-106, figs. 2).—In addition to the usual discussion of the agricultural situation and the usual tables of prices, price indexes, etc., the following articles are included: Dairy Marketing in Oklahoma, by A. L. Larson and D. C. McWhorter (pp. 79-85), discussing the importance and location of the industry, use made of products, marketing agencies, etc.; Large Scale Business Management in Farming, by P. Nelson (pp. 85-86); and An Analysis of the Public Finance Situation in Rural School Districts in Oil-Producing Areas, by L. A. Parcher (pp. 87-101), presenting data and discussing the actual difference in the public finance situation in school districts with and without oil development. Oil development causes an increase in population and encourages or requires an increase in expenditures and debt. Corporate and personal property are much more important as sources of revenue in the districts where oil is found. Net debt is higher in the oil districts, but the ratio of debt to valuation is not unusually high. In spite of higher taxes in the oil districts, tax delinquency is less than in nonoil districts. The per acre levy on land is slightly higher in the oil districts.

Land-use adjustments needed on farms in Deer Creek Township, Cass County, Indiana, B. R. HURT, E. C. YOUNG, and L. ROBERTSON. (*Coop. U. S. D. A.*). (*Indiana Sta. Bul.* 466 (1942), pp. 32, figs. 12).—This study is based on land-use data for 156 farms for the period 1932-36. The farms were divided into three groups on the basis of the dominant soils—dark upland, light upland, and mixed soils—and each soil group was further divided into three groups on the basis of size—99 acres or less, 100-174 acres, and over 174 acres. A typical farm in each size group in the dark and light upland soil groups was studied in detail. The area and the land-use pattern of the farms in it are described. The desirable land-use adjustments needed, the representativeness of the typical farms selected, the changes in farm organization and practices required to facilitate desirable adjustments, the directional effects of land-use adjustments on number and types of livestock, and the possibilities of carrying out the needed

adjustments are analyzed and discussed. Changes needed in organization are outlined for a 120-acre farm needing little adjustment and a 140-acre farm needing much adjustment. An appendix includes a description by T. M. Bushnell of the minor soil types in the township.

Of the farms on the dark upland soils, one-fifth needed almost no adjustment, three-fifths only minor adjustments, and one-fifth extensive revisions of the cropping systems. For the farms on light upland soils, the proportions were one-sixth, one-half, and one-third, respectively. The farms on the mixed soils needed drastic adjustments to keep erosion losses to a minimum. The principal adjustments needed for the township as a whole are a slight decrease in corn acreage; a considerable increase in sod legumes, particularly alfalfa and mixed pasture; some substitution of wheat for oats; removal of stock from land to be kept in woods; increased use of lime and fertilizers; adaptation of layout and field operations to physical features of the land; and a slight increase in the total livestock. Approximately 38 percent of the farmers lack financial means or managerial ability (chiefly financial means) to put the needed changes into operation. It is estimated that immediate income on 60 percent of the 156 farms would be reduced if the recommended land-use adjustments were carried out under average management but that incomes over a longer period would be increased.

Farming adjustments and agricultural conservation programs in West Virginia. F. D. CORNELL, JR., and C. W. CRICKMAN. (Coop. U. S. D. A.). (*West Virginia Sta. Bul. 304* (1942), pp. 40, figs. 5).—The study deals with farm-management problems in the area which includes Upshur, Harrison, Lewis, and Braxton Counties, and is typical of the larger livestock-grazing area in the northern and west-central part of the State. Particular attention is paid to the adaptability of the State agricultural conservation program and of the Upshur County experimental program. The outstanding feature of the experimental program was the requirement that part of the soil-building practices be carried out on pastures. Other features were that (1) payments for the application of superphosphate were made only where the land had been limed the same year or in the preceding 5 yr., (2) payments for seeding were made only where the land had been limed within the same or preceding 5 yr. and treated with superphosphate within the same or preceding year, and (3) arrangements were made by which farmers participating could obtain lime and superphosphate in lieu of payments. The area and types of farming and farm organizations are described. The pasture and low-income farm problems are discussed. The participation under the State and the experimental programs are analyzed and discussed. Some of the findings were:

Any program well suited to the needs of one county should be reasonably well adapted to all counties in the same type-of-farming area; the experimental program, in spite of its additional requirements, was accepted with little opposition; this program was instrumental in bringing about much more pasture improvement in Upshur County than in adjacent counties under the State program; the supplying of conservation materials in lieu of payments greatly stimulated their use, both as to amount and widespread application; the effects on pastures from the applications of lime and superphosphate resulted in enthusiastic support in Upshur County for a regular plan of pasture improvement; because of small farm allowances and the fact that small farms were among the last to cooperate in the program, the low-income farms probably benefited least from the programs; more emphasis on the educational phase of the program would be beneficial; and personal interviews were the most satisfactory source of information on the programs.

•

Ranch organization and management in the granite area, E. C. VOORHIES, L. A. CRAWFORD, R. L. ADAMS, and G. A. CARPENTER (*California Sta. Bul. 663* (1942), pp. 83-95, fig. 1).—The ranch management in the region surrounding the San Joaquin Experimental Range of the U. S. D. A. Forest Service is discussed in sections covering the development of the cattle industry, size of business and of breeding herd, feeding and breeding practices; stocking the range, calf crop, death losses, dehorning and branding, weaning, culling practices, other livestock enterprises, and flexibility in ranch management.

Measuring the productive value of pastures, H. J. L'HOTE (*Missouri Sta. Bul. 443* (1942), pp. 34, figs. 9).—The major objective of this study was to develop a method for measuring pasture productivity under farm conditions. The method adopted embodied "the determination of the feed requirement necessary to maintain the livestock and to produce the gains and products on pasture. The feed fed while the animal is on pasture is deducted from this requirement and the residual is the amount contributed by the pasture and therefore measures the pasture yield." Another phase was the determination of pasture animal unit values for various classes of livestock. This was done on the basis of value of pasture per head per day and per head for the pasture season. Data were obtained for seven areas representative of the major soil and type-of-farming areas of the State and included 364 permanent pastures (9,837 acres), 155 rotation pastures (1,952 acres), and 5,667 acres of supplemental pastures. The areas, the monthly rainfall and pasture conditions, 1936-38, and the methods of computing the productivity of the pastures and the value of pasture to various classes of livestock are described. The significance of pasture production and the potential pasture production in the State are discussed.

The yields per acre of permanent pastures in 1937 in corn equivalent on the different types of soil varied from 8 to 18.1 bu., averaging 11.2 bu. "The most productive rotation pastures were Sudan, second-year sweetclover, and barley pastured out. These crops may be expected on the average to give a return of 20 bu. of corn equivalent or more. A second group of medium productivity would include timothy, oats and Korean lespedeza, timothy and Korean lespedeza, rye, wheat, first-year sweetclover following small grain, and Korean lespedeza following small grain. These crops may be expected to yield between 10 and 20 bu. of corn equivalent. Crops yielding under 10 bu. of corn equivalent are mostly in the class of supplemental pastures. The more important ones in this group would be Korean lespedeza alone, rye pastured and harvested, pasture in small grain stubble, and pasture on timothy and clover meadow following the harvest of the hay crop." The potential pasture production for the State is estimated at 213,500,000 bu. of corn equivalent.

"The results of this study in addition to showing specific values for various pastures indicate two additional important facts. The first of these is that pasture production can be practically determined by this method of differences or by subtracting the supplemental feed received by animals on pasture from the normal feed requirement to maintain the animal and produce the gains which are realized while on that pasture. The second important fact is that pasture production under farm conditions will be materially less than that secured under very highly controlled experimental conditions, because farmers are not usually in a position to procure as nearly complete utilization without overgrazing as is true under experimental conditions."

Feeder cattle and sheep shipped into Minnesota, K. BJORKA, A. A. DOWELL, and G. ENGELMAN. (Coop. U. S. D. A. et al.). (*Minnesota Sta. Bul. 359* (1942), pp. 24, figs. 20).—Tables and charts are presented and discussed showing for

feeder cattle and sheep the volumes received, proportions bought at public stockyards and direct from other States, the ranks as to shipments of the stockyards and other States, the seasonal and geographical distribution of the shipments, and the relationship between incoming shipments and marketings.

During 1936-40 the incoming shipments of feeder cattle amounted to about 18 percent of the marketings; of sheep, they were about 42 percent. The largest shipments of both were in the months of August to October, but considerable numbers of feeder cattle were received in July and November. Of the feeder cattle, 57 percent cleared through public stockyards and 43 percent came direct from other States. Direct shipments of sheep amounted to 67 percent. The largest numbers of both cattle and sheep were fed in the southwestern part of the State.

Reducing the cost of producing dairy and poultry products in Missouri, B. H. FRAME (*Missouri Sta. Cir.* 237 (1942), pp. 7).—The possibilities of reducing costs are briefly discussed under the headings interest and taxes, miscellaneous charges, housing and equipment, labor, and feed.

Problems in marketing Utah fruits and vegetables, W. P. THOMAS, G. T. BLANCH, and A. L. STARK (*Farm and Home Sci. [Utah Sta.]*, 3 (1942), No. 2, pp. 1, 8, figs. 2).—Brief summaries are made of an investigation of the economic position of Utah fruits and vegetables on out-of-State markets and of a business analysis of the 1941 peach and cherry deals handled by cooperative marketing associations of the State. Information for the first study was obtained "largely by interviewing brokers, commission men, wholesalers, and retail handlers of fruits and vegetables and by observing Utah products on the markets in comparison with products from competitive production areas." The second study analyzed the efficiency of the business organizations which marketed most of the 1941 crop of peaches and cherries. "Attention was also given to the volume of Utah's production of fruits and vegetables and its distribution." The need for improvements in marketing fruits and vegetables in the State is discussed, and the essentials for a general program are outlined.

Production and prices of milk in the Springfield-Holyoke-Chicopee milkshed in 1935, A. A. BROWN and M. BOOTH (*Massachusetts Sta. Bul.* 389 (1942), pp. 32, figs. 6).—This is the third of a series of bulletins (F. S. R., 81, p. 724; 82, p. 269). The first part describes the milkshed in sections covering the geography, the area, exclusiveness of the milkshed, disposal of commercial production, number and distribution of producers among market groups and throughout the milkshed, premium milk, the significance of scale of production, and the importance of transportation and cartage rates. The second part analyzes and discusses the producers' farm prices. It includes tables and charts showing the average prices by areas; the average net prices by areas; the average prices f. o. b. for 3.7 percent grade B milk paid by dealers in three selected areas; a comparison of the weighted average of 3.7 f. o. b. prices for the three areas adjusted for charges with dealer's product costs; analysis of variance in milk prices received by 1,174 producers; the statistical measures of the effect of ratings when the sum of producer's ratings is approximately equal to the dealer's class 1 sales and when about equal to dealer's purchases from producers; a summary of price analysis of two groups of 29 shippers having a ratio of ratings to dealers of less than 90 and of 95-104 percent; distribution of prices received by full-time producers of grade B milk in three selected areas; and a comparison of prices received by shippers in three areas. The findings in the three studies are reviewed, and pricing f. o. b. the farm rather than f. o. b. the city is discussed.

Economic analysis of the Weber Central Dairy Association, W. U. FUHRMAN, H. H. CUTLER, and W. P. THOMAS (*Utah Sta. Bul.* 301 (1942), pp. 42,

figs. 8).—The objective of this study was to ascertain the factors affecting the marketing of dairy products and the relationship of marketing to production. The report describes the association, a cooperative organized in 1923, and analyzes the financial history and the methods used in marketing sweet cream, butter, powdered milk, and market milk. The first section on financial history and organization deals with borrowings, building up membership equity, percentage of assets owned by members, capital and current ratios, interest and equity payments to members, and loans to producers. The second section discusses the number of patrons and the butterfat deliveries per patron, yearly and monthly butterfat receipts, receipts from local associations, butterfat receipts in milk and cream, and the distribution of butterfat by departments. The third section deals with production and distribution costs and returns by departments and discusses the major expense items, the basis of assigning charges to departments, the expenses per pound of butterfat, the costs of processing market milk and manufacturing and selling powdered milk, departmental losses and profits, net profits per pound of butterfat by departments, returns to patrons, etc. Appendix tables show the monthly prices paid for butterfat in milk for 1928–30 and 1932 and 1933, in grade A, B, and C milk for 1931 and 1934–38, in all cream for 1928–30, and in sweet and sour cream for 1931–38.

Financial management analysis of farmers' cooperatives in Michigan, H. E. LARZELERE (*Michigan Sta. Spec. Bul. 315 (1942), pp. 96, figs. 11*).—"The general purpose of this study was (1) to obtain and analyze data relative to the nature and volume of business and to the capital structure of various types of cooperative marketing and purchasing associations in Michigan, (2) to compare the financial condition of Michigan cooperatives, and (3) to develop selected management ratios for the use of managers and directors of cooperative associations in formulating policies and in controlling operations." It is based on data mostly for the year ended June 30, 1937, collected by the St. Paul Bank for Cooperatives assisted by the station. In the analysis the associations are divided into 11 groups according to the major type of service performed, consisting of 55 dairy, 31 livestock, 25 grain, 21 fruit, 23 potato, and 3 miscellaneous marketing associations; 30 associations the business of which was about equally divided between the marketing of produce and the sale of supplies; 67 associations selling farm supplies chiefly; 20 associations handling petroleum and consumer merchandise; 3 milk-bargaining associations; and 5 federated commodity exchanges. The different types of associations and their locations are described. The volume of business and methods of operation, sources of capital and methods of financing, the financial condition of the local cooperatives as reflected in the average balance sheets and in the operating statements for the different types of associations, and the policies in the disposition of earnings are analyzed and discussed. Seven management or sales ratios—sales to net earnings, to gross margin, to expenses, and to total assets, revenue to fixed assets, supply sales to accounts receivable, and cost of goods sold to inventory—and four financial or balance sheet ratios—current assets to current liabilities, inventory to accounts receivable, and net worth to total capital and to fixed assets—were used to measure the financial condition and operating efficiency of the associations. An appendix includes tables showing the methods of operation in the various types of associations; number of associations having various forms of membership equity; secondary sources of credit used by the associations in 1936; short-term commodity, operating capital, and facility loans outstanding in 1936; and the proportion of total assets represented by notes payable and long-term liabilities for different types of associations in 1937.

World wheat survey and outlook, May 1942, J. S. DAVIS (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 18 (1942), No. 8, pp. [2]+339–366, figs. 6*).—

"Huge wheat surpluses in all four chief exporting countries and varied but growing bread shortages in Europe (outside the United Kingdom) continue to dominate the world wheat position. War developments since December 7 have influenced it mainly by making shipping scarcer, stopping the flow of basic products from the Southwest Pacific, and spurring the United States to all-out efforts as a leading partner in the United Nations. In this country, political measures have boosted wheat prices to levels suggestive of shortage instead of embarrassing abundance. The Commodity Credit Corporation, having been hampered in disposing of its owned stocks and having acquired well over half of the 1941 wheat put under loan, will control some 60 percent of the carry-over of 610-650 million bushels. Advance steps are being taken to cope, as best may be, with the storage crisis that harvesting the big crop of winter wheat will bring. . . . Japan now controls the rice-surplus areas of Asia. By contrast, the European Axis and neutral countries are weak in bread-grain supplies, in which the United Nations are exceptionally strong."

The fruit industry of Argentina, F. A. Morz (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr. Rpt. 1 (1942), pp. [2]+102, figs. 44*).—The fruit industry of Argentina is discussed in sections on the production and marketing of deciduous fruits, of grapes, and of citrus fruits and Argentina as a market for American fruit. The section on deciduous fruits deals with the quantity and variety of production, the fruit regions, production practices, harvesting dates, packing and packing facilities, cost of production and prices, transportation and cold-storage facilities, markets and marketing methods, Government inspection service, canning and drying industries, trends and general outlook, etc. The section on grapes discusses the producing regions, production practices, yields, harvesting dates, packing, costs of production and marketing, marketing, and future prospects. For citrus fruits the description covers the producing regions, growth of the industry, rootstock problems, cultural practices, production costs, yields, grading and packing, marketing season, markets, selling prices, and prospects for the industry.

The author states that Argentina as an important outlet for American fruits is extremely doubtful and decidedly remote because of the excessive tariff barriers, exchange restrictions, and high freight rates; that United States exports to Argentina declined nearly 93 percent from 1929-30 to 1938-39; that trade agreements of October 14, 1941, between the United States and Argentina may restore some of the trade lost; that only about 10 percent of the population of Argentina, mostly in Buenos Aires, has sufficient purchasing power to buy United States fruits; that assuming all trade barriers in Argentina were removed it is doubtful whether takings of United States apples and pears would exceed half a million boxes annually; that Argentina is a doubtful potential market for California grapes as the landed cost is prohibitive and the demand is restricted entirely to a limited luxury-class trade; and that exports of fruits to Argentina are limited to a few varieties popular on its markets.

The fruit industry of Brazil, F. A. Morz (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr. Rpt. 2 (1942), pp. [2]+45, figs. 17*).—The fruit industry of Brazil is discussed in sections on fruits other than citrus (Temperate Zone and tropical fruits), citrus fruits, cultural practices of the citrus industry, disposal of the citrus crop, and Brazil as a market for American fruits.

In summarizing it is stated that Brazil is capable of producing an almost unlimited variety of fruits; that from a commercial point of view pineapples, bananas, and oranges are the most important fruits produced or are those entering export channels; that commercial development of citrus fruit, especially oranges, has taken place rapidly and on a large scale during the last few years;

that this development can go on almost indefinitely; and that without a great deal of effort Brazil could produce more than the world's requirements of summer oranges and could almost supply the year-round requirements.

"The possibility of developing an important market in Brazil for American fruit is very doubtful. Apple exports to Brazil under normal trading conditions in the pre-war years 1936-37 to 1938-39 averaged about 1.5 percent of the total United States export business, and pears average about 3.3 percent. While it is believed that exports to Brazil could be increased slightly, provided certain conditions were met, the volume moved could in no way replace or even approach the shipments made to certain European countries."

The fruit industry of Chile, F. A. MOTZ (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr. Rpt. 3 (1942), pp. [2]-46, figs. 10*).—The several sections discuss the land and the people; the fruit-producing regions; the varieties, extent of season, production, and exports of apples, pears, plums, peaches, apricots and nectarines, grapes, melons, citrus fruit, and miscellaneous tree fruits; the cultural practices; harvesting, storage, and marketing; canning and drying industries; and the United States in relation to the Chilean fruit industry. The following statements are made regarding the United States in relation to the Chilean fruit industry:

"Because of its small population with very limited purchasing power, Chile offers but little encouragement as a market for United States fruit. High production costs and transportation charges on American fruit practically eliminate Chile as an outlet for any volume of fruit from the United States. Domestic supplies of apples and pears are available in Chile throughout the greater part of the year, and during the off season the trade is supplied with canned and dried fruits, which are of good quality and cheap. Early fruits and vegetables are on the market when storage supplies are no longer available. Since Chilean exports to neighboring South American countries have been decreasing and exports to Europe increasing, the European war is having a serious effect upon the industry. Supplies that are ordinarily destined for overseas markets have to be disposed of locally, which brings up the problem of wider distribution on local markets and extension of the marketing period. With only about 4.5 million inhabitants, nearly 25 percent of which live in two cities, Chile can boast of no large consuming centers. The envy of the average Chilean fruit grower is the market of 130 million people in the United States, all of whom are regarded as potential consumers of Chilean fruits. Instead of offering a market for American fruits, Chile is looking toward the United States as an outlet for its surpluses."

RURAL SOCIOLOGY

Some cultural factors related to occupational mobility among Wisconsin farmers, G. W. HILL and H. T. CHRISTENSEN. (*Univ. Wis. et al.*). (*Rural Sociol.*, 7 (1942), No. 2, pp. 193-200; *Span. abs.*, pp. 193-194).—"Based upon a field survey of Wisconsin farm families, this study shows that farm boys are entering nonfarm occupations to a greater degree than formerly and that their movement is influenced by a number of cultural factors. Nearly two-fifths of the farm-reared boys of today are in nonfarm work, as compared with about one-fifth two generations ago. Desertion of farming as an occupation is greater in families of low economic status. Nationality and religion also affect this behavior, but their influences were found to be greatest where economic pressures are weakest, i. e., in families of high economic status. In comparison with German farmers, Scandinavians have the greater occupational mobility and the greater increase in the same; and in comparison with Lutheran farm-

ers, Catholics have the greater occupational mobility and increase in the same. Thus it seems that the German-Lutheran-high economic status combination is most favorable to the retention of farming as a family occupation. There was found to be a negative relationship between size of family and occupational mobility, a fact which taken along with the observation that Catholic families are disproportionately large may help explain the higher occupational mobility among Catholics. Factor comparisons based upon territorial mobility resulted in essentially the same generalizations as those for occupational mobility given above."

Migrants from rural South Dakota families: Their geographical and occupational distribution, W. L. SLOCUM (*South Dakota Sta. Bul. 359 (1942), pp. 20, figs. 6*).—This report presents a graphic picture of the main currents of geographical migration and of the patterns of occupational choice. "Prior to 1936 the pattern of geographical migration was mainly that of short-range movement. More migrant sons stayed in the home county than left it, and more than 6 out of 10 of both sexes stayed within the borders of the State of South Dakota. For those who left the State, the west coast, especially California, seemed to be peculiarly attractive; all but a few avoided the southern and far eastern States. . . .

"With the advent of defense work and of war major changes have taken place in the patterns of migration and occupational choice. The traditional pattern of short range migration has been altered for girls and boys alike, but especially for boys. Instead of emphasis upon short range movement the current emphasis is upon long range migration, especially to California. Likewise the movement of young men into agriculture has almost ceased. Defense work and service in the armed forces now takes boys leaving parental homes."

The Riner Community, an area of population flow, C. G. BURR and L. E. MOSELEY (*Virginia Sta., Rural Sociol. Rpt. 21 (1942), pp. [6]+24, figs. 4*).—This is the fourth in a series of community studies (E. S. R., 68, p. 120; 70, p. 556; 74, p. 564). The point most stressed in this study is the high degree of population turnover in the Riner community, i. e., the constant population flow through the community from adjacent areas of population pressure.

Boom migration: Incidence and aftermath, R. T. McMILLAN. (Okla. A. and M. Col.). (*Rural Sociol., 7 (1942), No. 2, pp. 145-155; Span. abs., p. 145*).—"It is estimated that 3.5 million civilians have migrated as a result of employment opportunities and increased wages in nonagricultural industries. The defense boom is primarily industrial, with the heaviest population movement recurring within and between cities, followed in order by withdrawals from rural-nonfarm and rural-farm aggregates. Defense migration is selective of white, single men under 30 yr. of age. Generally, migrant families are smaller than the average. Occupationally, skilled and semiskilled workers are in greatest demand. Uncertainty of the future, increased living costs, and high taxes seem to discourage savings among defense-boom workers. To counteract some of the effects of vast unemployment, relatively low wages, and undesirable levels of living anticipated in the post-war period, strongly centralized governmental control over the economic structure appears imminent. The measures utilized may afford greater protection to the socioeconomic status of large capitalists and public officials than to that of small-property holders, salaried employees, and wage earners."

The influence of tenure status upon rural life in eastern South Dakota, W. L. SLOCUM (*South Dakota Sta. Cir. 39 (1942), pp. 20, figs. 6*).—"The evidence of this study suggests that . . . families that own their farms and their equipment free of encumbrance take better care of their property than do other

types of operators; they also tend to be more neighborly, and more of them support the church. They do not, however, participate in the programs of organized groups to any large extent."

The role of rural society in the production of workers and soldiers, W. S. THOMPSON (*Rural Sociol.*, 7 (1942), No. 2, pp. 127-133; *Span. abs.*, p. 127).—"The role of rural society in providing the Nation with soldiers and workers is not adequately measured by the number of persons going directly from rural communities into these tasks. . . . Because of the declining birth rate and the stationary rural farm population this group will in the future contribute a smaller proportion of soldiers and workers to the Nation than in the recent past in spite of the fact that its birth rate remains considerably higher than that of the urban population. . . . Because of the declining proportion of farm population and the declining birth rate, we shall also have a smaller total of soldiers and workers in the prime of life 25 yr. hence than we now have."

Louisiana farm laborers and total war, H. HOFFSOMMER and R. J. RAMSEY. (Coop. U. S. D. A.). (*Louisiana Sta. Bul.* 346 (1942), pp. 18, figs. 4).—A total of 564,000 persons over 14 yr. of age were enumerated in the census of April 1940 as living on farms in Louisiana, of whom 290,000 were capable of full-time work. "When the estimated loss of labor to the armed forces and industry is accounted for, the labor force remaining on farms in 1942 will be approximately 165,000 men and 35,000 women, or a total of 200,000. Since most of those leaving the farm are from 18 to 35 yr. of age, those remaining will not be capable of doing as much work as those leaving the farm." The conclusions are reached that "the solution must be a more intensive use of the normal labor force remaining" and, "under extreme conditions, all available able-bodied town and city dwellers will be needed for a short harvest season."

The role of the village in American rural society, T. L. SMITH. (La. State Univ.). (*Rural Sociol.*, 7 (1942), No. 1, pp. 10-21; *Span. abs.*, p. 10).—"As a center of trade and commerce the village has long played a vital role in American rural society. Its function as a trade center continues to wax in importance, and at the same time the village is rapidly coming into its own as the center of the emerging rural community. Exact data concerning the number, distribution, and population of American villages are not to be had. The census includes in its tabulations only incorporated villages, numbering 10,436 in 1940, and gives very scanty information for these. A method for estimating the population of unincorporated villages from a knowledge of the number of business firms doing business in them is described, and the number of such places estimated to be approximately 7,500. The total population of villages of all types is estimated at 14,500,000. In addition to its roles as a center of trade and commerce and as the nucleus of the emerging rural community, other functions of the village are analyzed. The village serves as a place of residence for disproportionately large numbers of some of the most dependent groups in American society and particularly for aged persons of both sexes and for widowed and divorced females. The village is also the arena in which rural and urban attitudes and patterns of living collide with one another."

The local community and social control, C. R. HOFFER. (Mich. State Col.). (*Rural Sociol.*, 7 (1942), No. 1, pp. 81-84).—"The author examines the hypothesis that "the local community has an important influence in social control, notwithstanding the fact that within recent years numerous social changes suggest a different conclusion."

Patterns of crime in a rural South Dakota County, J. USEEM and M. WALDNER (*Rural Sociol.*, 7 (1942), No. 2, pp. 175-185; *Span. abs.*, p. 175).—"In a rural area, relatively untouched by urbanization, a survey of offenders during

the past 50 yr. reveals delinquency is growing in excess of population increase. There is a high incidence of criminality among town people, certain ethnic groupings, the divorced and unmarried, and the young. These are reflections of the roles which members of these strata occupy in the local social order. Communities have little insight into the factors producing criminality, and regard each delinquent as a case of personal demoralization. The administration of justice is attuned to punishment rather than to prevention or rehabilitation. Crime in a rural society requires analysis in the context of rural life rather than merely through comparison with urban patterns."

Rural public assistance and national defense, J. C. BROWN (*Rural Sociol.*, 7 (1942), No. 2, pp. 133-145; *Span. abs.*, p. 133).—"The effect of the defense program on rural public assistance is most apparent in rural 'defense areas,' in the neighborhood of army stations, naval shore and coast guard establishments, and new defense industrial plants. Reports from such areas in 20 States indicate that the situation of relief recipients and low-income families is aggravated by the increased cost of living, that the composition of part of the relief load is being modified without a reduction of the total need, and that the lack of suitable housing and sanitation, the increase in migration, and juvenile delinquency have created serious social and health problems. Federal leadership and funds are badly needed, as well as additional professional personnel to assist State and local public welfare agencies in handling these problems which so acutely affect family life and child welfare."

The Farm Security Administration and its attack on rural poverty, J. J. KING. (U. S. D. A.). (*Rural Sociol.*, 7 (1942), No. 2, pp. 155-161; *Span. abs.*, p. 156).—"The practical technics of action are premised on the initial assumption that low-income farm families, if provided with sound economic and social opportunities, will democratically grasp these opportunities and improve their conditions. The technics are: The rural rehabilitative loan with supervised guidance in home and farm management; the tenure improvement program; the water facilities work; the farm debt adjustment activity; the community and cooperative services, permitting small-scale operators to compete with large, corporate producers; the tenant purchase program; the migratory labor camps; the medical services; the cash grant aids; and others. All these technics are being integrated into one concentrated drive on mental and physical rural poverty."

Farmers, attitudes to farm programs, D. R. JENKINS. (Clemson Agr. Col.). (*Rural Sociol.*, 7 (1942), No. 2, pp. 185-193, fig. 1; *Span. abs.*, p. 185).—"In a further discussion of the survey noted (E. S. R., 87, p. 301), it is noted that "clusters of individuals reacted in a similar manner to certain groups of questions. For example, one cluster strongly favored youth programs, old-age assistance, and land-use planning but was neutral toward live-at-home programs. Another cluster strongly opposed all programs except cover crops and conservation payments, and so on. A statistical technic is applied here to identify the patterns of response in detail. Background traits that explain the cluster blocs are examined."

FOODS—HUMAN NUTRITION

[Food and nutrition studies at the Idaho Station] (*Idaho Sta. Bul.* 244 (1942), pp. 8-9, 42-43).—This progress report (E. S. R., 85, p. 855) summarizes work on drip and evaporation losses of frozen steaks, by D. E. Brady, P. Freil, and C. W. Hickman (pp. 8-9); studies on the value of the protein of field peas, by E. Woods, W. M. Beeson, J. W. Pence, and D. W. Bolin (pp. 42-43); and studies in extension of earlier work on the ascorbic acid metabolism of young men and the vitamin B complex factors in Russet Burbank potatoes, both by Woods (p. 43).

[Food studies by the Indiana Station] (*Indiana Sta. Rpt. 1941*, pp. 77-78).—This progress report (E. S. R., 83, p. 121) summarizes an extension of studies on the palatability, cooking losses, and tenderness of frozen pork and preliminary work on frozen beef, both by R. Jordan and O. D. Milligan.

Food values in shares and weights, C. M. TAYLOR (*New York: Macmillan Co., 1942*, pp. XI+92, figs. [11]).—This book presents data on the calories, protein, calcium, iron, vitamin A, thiamin, ascorbic acid, and riboflavin in serving portions, defined by weight and measure, of approximately 500 common foods and prepared dishes. The values are tabulated in terms of shares and again in terms of weight. The share system is explained. The measures, weights, and calorie values of many of the recipes are taken from Food Values of Recipes in Shares and Vitamin Units, by M. S. Rose and C. M. Taylor, a booklet which the present publication replaces. The protein, mineral, and vitamin values have been recalculated on the basis of more recent data on food composition, and the share values are based on the new dietary allowances.

Some nutritional values of common foods [and] nutritional requirements of individuals (*Colo. Farm Bul. [Colorado Sta.]*, 4 (1942), No. 2, pp. 14-16).—Tabular material is given on the values of selected foods grouped as animal products, cereals and nuts, fruits, vegetables, and sugar in terms of the calorie values and quantities of various nutrients, including proteins, vitamin A, thiamin, ascorbic acid, riboflavin, calcium, phosphorus, and iron present in average servings; and on the nutritive requirements of individuals of different ages in terms of the daily allowances for specific nutrients recommended by the committee of food and nutrition of the National Research Council.

Sorghum and sugarcane sirups increase in importance as good substitutes for sugar, O. SHEETS (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 5, p. 2).—These sirups, although not as sweet as cane or beet sugar, offer the advantage of being comparatively cheap and easily prepared in the southern farm household. They are good energy foods and are superior to sugar in nutritive value in that they contain the essential minerals Ca, P, Fe, and Cu.

Edible soybeans, W. C. SHERMAN and H. R. ALBRECHT (*Alabama Sta. Bul.* 255 (1942), pp. 16).—Since soybeans are successfully grown in the South and offer definite possibilities of improving the protein, mineral, and vitamin content of southern diets, experiments were conducted to determine what varieties of edible soybeans are best adapted to culture in Alabama. Data are reported on yields, the date of maturity, seed characteristics, and cooking quality of mature soybeans of early, late, and midseason varieties grown in these experiments. From results with the green shelled soybeans, also included in the test, it is concluded that green vegetable soybeans for table use from mid-July to late September or early October will be assured by selection of one or more varieties in each of the following groups: Early—Willomi, Imperial, or Emperor; midseason—Funk Delicious, Hokkaido, or No. 85550; and late—Rokusun, Tokio, No. 93057, Delsta, or Delnoshat. The nutritive value of soybeans is considered, particularly in comparison with that of cowpeas and other beans and peas. Recommendations for growing edible soybeans and the methods of preparing them for table use are also given.

Arsenic in fresh-water fish, M. M. ELLIS, B. A. WESTFALL, and M. D. ELLIS. (Univ. Mo. et al.). (*Indus. and Engin. Chem.*, 33 (1941), No. 10, pp. 1331-1332).—The arsenic content of 15 species of fresh-water fish, determined by analysis of 681 fish from 15 inland waters in Florida, Georgia, Alabama, and Texas, was found to average about 0.75 p. p. m. as As_2O_3 on the basis of total wet weight, or 3.54 p. p. m. on the basis of total dry weight. This content, it is pointed out, is considerably lower than that reported for marine fish. Figures on the total

wet basis are representative of the arsenic content of fish meals. The eviscerated portion representing the part usually consumed as food was analyzed separately for 156 of the fish, including bass, buffalo, carp, suckers, sunfish, and five other species. Average and maximum values obtained for these were 0.48 and 2.55 p. p. m. on the wet basis and 1.85 and 11.89 p. p. m. on the dry basis. Total oil obtained as the ether extract of the whole fish averaged 11.80 p. p. m. of arsenic (As_2O_3) and ranged as high as 160.71 p. p. m. This oil, constituting only 2.49 percent of the total wet weight, carried 22.8 percent of the total arsenic of the fish. Fourteen visibly fat, large-mouthed black bass in which the liver masses were assayed separately showed the total oil (constituting 5 percent of the weight of the fish) to contain on an average 3.13 p. p. m. of arsenic; the body oil 2.29 p. p. m.; the oil from viscera without liver 4.37 p. p. m.; and the liver oil 40.51 p. p. m. In view of the findings it is considered that fresh-water fish, and particularly their livers and oils, must be regarded as potential sources of arsenic in foods and other commercial products utilizing fresh-water material.

Mold inhibitors for food products, H. MACY. (Univ. Minn.). (*Assoc. Food and Drug Off. U. S., Quart. Bul.*, 6 (1942), No. 1, pp. 9-12).—This paper, presented as an address, reviews briefly significant research contributions concerning mycostatic and fungistatic agents applicable to foods as mold inhibitors. It is indicated that of the various chemical compounds or methods suggested for inhibiting mold growth on foodstuffs none to date have proved as unobjectionable as the sodium or calcium propionates.

Preservation of victory foods a farm home goal, E. A. CURREY (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 5, p. 1).—Canning, possibly at community canning centers; freezing and frozen storage at freezing plants; sun-drying; and storage in ventilated pantry, storage basement, or outdoor cellar or storehouse are noted as methods available for preservation of fruits and vegetables grown in Mississippi home and victory gardens.

Preparing fruits and vegetables for refrigerated locker storage (*Oklahoma Sta. Misc. Pub.* 7 (1942), pp. 6).—Products desirable to conserve under Oklahoma conditions, selection of varieties desirable from the standpoint of quality and production, and selection of suitable containers are discussed in general terms; and specific directions are given for individual fruits and vegetables with regard to handling and preparation for freezing.

Drying fruits and vegetables for home use, A. L. STARK and E. MILLER (*Farm and Home Sci. [Utah Sta.]*, 3 (1942), No. 2, pp. 3, 10-11, figs. 3).—General information is given concerning temperature, air movement, and the sulfuring process applied in the drying procedure. Practical directions for drying individual fruits and vegetables under Utah conditions cover such points as satisfactory stage of maturity, preparation for drying, sulfuring (when applied), and drying times and conditions.

Medical evaluation of nutritional status, II-VI. (Cornell Univ. et al.). (*Milbank Mem. Fund Quart.*, 18 (1940), No. 4, pp. 403-424, figs. 4; 19 (1941), Nos. 1, pp. 45-71, figs. 6; 3, pp. 207-240, pls. 2; pp. 241-251; pp. 252-281, figs. 9).—This continues the series (E. S. R., 84, p. 842).

II. Measurement of visual dark adaptation with the adaptometer, E. P. HUNT and C. E. PALMER.—The Hecht-Shlaer adaptometer is subjected to critical examination as to the uniformity of results obtained with three different instruments of the same type and the errors of measurement as determined by repeated tests with one instrument on the same individual. Certain suggestions are given for modifications and extensions of the original specifications, and the results of the study of errors of measurement are summarized as follows:

"Variation in the subjective criteria of perceptible light flashes may be of sufficient magnitude to account for a considerable proportion of the variation among different individuals in final threshold values obtained after 30 min. of dark adaptation. Study of duplicate adaptometer tests indicates that there is a marked difference in the reliability of threshold measurements for different periods during dark adaptation. The variability of duplicate tests increases rapidly from 30 sec. to a maximum at 9.5 min. and thereafter declines to a minimum of ± 0.09 log unit after 30 min. of dark adaptation."

III. *Hemoglobin and erythrocyte values for adolescents in high-income families*, D. G. Wiehl.—A detailed study was made of hemoglobin and erythrocyte values in 155 boys between 12 and 18 yr. of age and 140 girls between 12 and 17 yr. These children, selected as being without apparent infection, disease, or nutritional deficiency, were all attending a private school in New York City and were mostly from Jewish families. In the girls, the change from childhood levels apparently began before the age of 12 yr. In the 12- to 17-yr. age period observed it was found that hemoglobin in the whole blood was about the same at every age, averages at the specific ages varying from 13.9 to 13.7 gm. per 100 cc.; that the number of red cells per cubic millimeter of blood decreased with age from 5.4 to 5.1 millions; that mean red cell volume increased from $82.1\mu^3$ at 12 yr. to $87.8\mu^3$ at 16-17 yr. combined; that hemoglobin content per cell increased slightly with age from 26.0 to $27.2\mu\text{g.}$; and that the concentration of hemoglobin in the red cells varied significantly at these ages. With the boys, hemoglobin in whole blood increased from 13.6 gm. per 100 cc. at 12 yr. to 15.3 gm. at 17-18 yr., most of the increase coming at 13 and 14 yr.; the number of red cells increased at 13 yr. and then decreased to a fairly constant count of about 5.7 millions; the mean red cell volume increased from $70.6\mu^3$ at 13 yr. to $85.6\mu^3$ at 15 yr. and to $87.7\mu^3$ at 17-18 yr. The marked changes observed in this detailed study of adolescents indicated that in any study of a comparable group the results must be evaluated on the basis of standards according to sex and year of age.

IV. *The ocular manifestations of avitaminosis A, with especial consideration of the detection of early changes by biomicroscopy*, H. D. Kruse.—This is a preliminary report on the biomicroscopic examination of the conjunctiva as a means of detecting early vitamin A deficiency and of determining the requirements of this vitamin. Of a group of 166 adults, including both white and Negro, in a low-income group 65 showed gross ocular manifestations of vitamin A deficiency in the form of one or more characteristic raised spots known as Bitot's spots. These are described in some detail, with colored photographs illustrating lesions of varying degree. Among 143 subjects who were given, in addition to the gross examination, a microscopic examination under slit-lamp illumination, 45 percent showed gross and 54 percent microscopic ocular lesions. The latter are described and differentiated from those of riboflavin deficiency. In addition to further characterization of the spots, the biomicroscope reveals changes in the degree of light transmission of the conjunctiva, with transparency, translucency, and opacity representing progressively advancing stages.

Following continuous vitamin A therapy in daily doses of 100,000 International Units of a part of the group, the conjunctival lesions of 9 subjects disappeared entirely in from 6 to 8 mo. In all the others marked improvement "to the point of near disappearance" took place, while a control group not receiving therapy showed no improvement.

The report includes a lengthy review of the literature on the ocular manifestations of vitamin A deficiency with particular reference to the relative time of appearance of xerosis conjunctivae and night blindness, with the conclusion that xerosis probably precedes night blindness as an early sign of avitaminosis A.

V. *Prevalence of deficiency diseases in their subclinical stages*, D. G. Wiehl and H. D. Kruse.—Data from the survey described in the first report of the series were used in the estimation of the relative prevalence of mild cases of vitamin A, riboflavin, and vitamin C deficiency and nutritional anemia in three groups—(1) high school students in the group of relatively high income (not tested for vitamin A), (2) high school students of the low-income group, and (3) W. P. A. employees, all in New York City. The diagnoses of vitamin A deficiency and ariboflavinosis were based on examination with the biomicroscope under slit-lamp illumination, as noted above for vitamin A and by Kruse et al. (*E. S. R.*, 84, p. 707) for riboflavin, hemoglobin by colorimetric determination of oxyhemoglobin with the Evelyn photoelectric colorimeter, and plasma ascorbic acid by the photoelectric colorimetric procedure of Mindlin and Butler (*E. S. R.*, 80, p. 728).

In (1) few of the subjects showed a deficiency of ascorbic acid, iron, or riboflavin, and in no case was there multiple deficiency. Among the boys the only significantly low values were for ascorbic acid, with values less than 0.6 mg. per 100 cc. in 6.7 percent. Among the girls hemoglobin values less than 12 gm. per 100 cc. were found in 3.1 percent, mild riboflavin deficiency in 4.7 percent, and low ascorbic acid values in 4.2 percent of the group. In (2) 86.6 percent of the children showed some stage of vitamin A deficiency, 75.8 percent mild ariboflavinosis, 49.9 percent low plasma ascorbic acid values, and 3.3 percent hemoglobin values below the assigned minimum. Boys showed relatively advanced stages of these deficiencies to a greater extent, with the exception of iron, than the girls. Many had multiple deficiencies. In (3) all but one showed some stage of vitamin A deficiency, with 45.5 percent of the group showing the more advanced or spot changes. These were much more prevalent among the men than the women. Riboflavin deficiency was evident in 38.4 percent of the subjects, with no significant differences between the men and the women. Low plasma ascorbic acid levels were found in 55.2 percent and hemoglobin levels below the standard in 6.8 percent of the women and 7.6 percent of the men.

VI. *Dark adaptation of high school children at different income levels*, E. P. Hunt.—High school students from the groups represented in the cooperative investigation, selected as being in good health and willing to participate in the study, served as subjects. The dark-adaptation tests were made with a Hecht-Schlaer adaptometer, and preceding the test each subject was given a physical examination, including observations on the condition of the eyes and the Snellen visual acuity test. Diet histories were obtained for the 2-day period immediately preceding the adaptation test, and anthropometric measurements were taken either on the day of the test or 1 or 2 days later. The data, subjected to extensive statistical treatment, are summarized essentially as follows:

The mean threshold after 20 min. for 131 of the low-income group was 2.765 log units with a variability of ± 0.516 log unit, and for 136 children in the high-income group 2.540 log units with a variability of ± 0.330 log unit. The mean threshold level at this time was not affected in either income group by age; sex; visual acuity; pigmentation of the iris; hour of the test; time of color change from purple, violet, or blue to gray or white; or phase of the menstrual cycle. The mean threshold level at 30 min. for 175 cases of the high-income group was 2.463 log units with a variability of ± 0.154 log unit. In the low-income group 78 percent and in the high-income group 44 percent of the diets provided less than 5,000 International Units of vitamin A daily.

Appraisal of nutritional status (*Amer. Jour. Pub. Health*, 31 (1941), No. 10, pp. 1061-1082, figs. 7).—This report of a symposium held at the 1940 meeting of the American Public Health Association consists of Introductory Remarks, by F. G. Boudreau (pp. 1061-1062) and the following papers on different phases

of the cooperative nutritional status investigation noted above: Dark Adaptation Characteristics of Private School Children Measured With the Adaptometer, by C. E. Palmer (pp. 1063-1067); Medical Evaluation of Nutritional Status—Roentgen Appraisal of Development, by W. M. Schmidt (pp. 1068-1072); Selecting Cases of Anemia Among Adolescents, by D. G. Wiehl (pp. 1073-1078); and Chemical Methods for Determining the Plasma Level of Vitamin C, by H. D. Kruse (pp. 1079-1082).

Effect of various dietary supplements on growth and lactation in the albino mouse, Z. B. BALL and R. H. BARNES. (Univ. Minn.). (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 3, pp. 692-696).—The basal diet in the experiment reported consisted of glucose, casein, lard, yeast, and salt mixture. Young mice on this diet with no supplements grew at a better rate than others on a commercial food mixture (Purina Fox Chow) alone or supplemented with lettuce and a dried brewers' yeast. Ascorbic acid had no effect on the food intake or growth. Lactation was unsatisfactory. The addition of ascorbic acid or liver extract alone did not increase the survival period of the young through the suckling period, but dehydrated grass and wheat bran improved the lactation and there was evidence that the effects were additive, as was also the case with ascorbic acid and wheat bran. Supplementing the wheat bran with inositol or phytin not only was without beneficial effect but appeared to have a deleterious effect. It is concluded that the lactation-promoting effect of the dehydrated grass and wheat bran is not due to an increase of thiamin, riboflavin, pantothenic acid, factor W, or inositol in the diet.

Cucurbit seed globulins.—I, Amino acid composition and preliminary tests of nutritive value, H. B. VICKERY, E. L. SMITH, R. B. HUBBELL, and L. S. NOLAN. (Conn. [New Haven] Expt. Sta.). (*Jour. Biol. Chem.*, 140 (1941), No. 2, pp. 613-624).—As noted in a preliminary report (E. S. R., 85, p. 270), globulins from cucurbit seeds were prepared as possible substitutes for edestin, now scarcely available. The method of preparation consisted of extracting the ground, air-dried, nondefatted seeds with warm 10 percent NaCl, heating the turbid extract to 75° [C.] to effect coagulation of minor quantities of the proteins, presumably of the albumin type, and of siphoning the aqueous phase from under the fat emulsion which separated upon cooling and standing. The aqueous phase thus obtained was filtered through a thick layer of paper pulp, centrifuged, and refiltered, and the globulin was precipitated by treatment of the filtrate, heated to 60°, with 4 volumes of water also at 60°, and allowed to stand overnight in the cold. The precipitate obtained was recrystallized and washed by suspension in 30 percent alcohol and finally with 95 percent alcohol on the funnel. By this method yields of from 6.2 to 15.4 percent, on the basis of air-dried, whole seeds, were obtained from seed of the various species of Cucurbitaceae. Low ash values indicated a high degree of purity of the preparations with respect to inorganic contamination. The crystalline globulins from the squash and the pumpkin seeds were indistinguishable on the basis of yields of arginine, tyrosine, and tryptophan, but these three globulins did differ on this basis from those from watermelon, cantaloup, and cucumber seeds. The watermelon seed globulin yielded 17.9 percent arginine, this being a higher proportion than from any other vegetable protein on record. Feeding tests with rats receiving hemp seed edestin or the globulin of *Ocurebita moschata* as the sole source of protein in an adequate diet showed these to have about equal nutritive value. Neither was as satisfactory as casein or lactalbumin in producing rapid growth. Watermelon seed globulin was less satisfactory than that of squash seed as the sole source of protein for young animals.

The synthesis of cystine in vivo, W. C. ROSE and T. R. WOOD. (Univ. Ill.). (*Jour. Biol. Chem.*, 141 (1941), No. 2, pp. 381-389).—Young rats were fed a

basal diet in which the nitrogenous components were supplied in the form of a mixture of amino acids devoid of cystine and methionine and in which other dietary factors were adequate. In experimental ad libitum feeding experiments of 36 or 48 days, the rats received this basal diet supplemented (1) with cystine and methionine or (2) with methionine alone. At the end of the feeding tests the animals were killed and analyzed in toto to determine the gain in tissue cystine over the content at the beginning of the tests, as determined by analysis of control rats killed at that time. The results showed that as much as from 4 to 6 mg. of cystine had been synthesized daily for purposes of growth. No significant differences were observed in the cystine increases in the tissues or in the rates of gain in body weight of animals receiving (1) methionine alone, and (2) methionine plus cystine. The 4-6 mg. appeared thus to represent a close approximation of the cystine requirement of the young growing rat for new tissue formation. Since in certain of the experiments methionine was the only organic sulfur compound available in sufficient proportions to account for the cystine deposition in the tissues, it is concluded that the sulfur of methionine was utilized in the manufacture of cystine.

The utilization of the methyl group of methionine in the biological synthesis of choline and creatine, V. DU VIGNEAUD, M. COHN, J. P. CHANDLER, J. R. SCHENCK, and S. SIMMONDS. (Cornell Univ.). (*Jour. Biol. Chem.*, 140 (1941), No. 2, pp. 625-641, fig. 1).—The experiments here described were devised to test the previously suggested theory (E. S. R., 84, p. 274) that methionine in the diet might serve as a source of methyl groups in the metabolic elaboration of choline. Rats were fed methionine containing a deuteriomethyl group, and the transfer of these labeled methyl groups was demonstrated by the isolation of deuteriocholine and deuteriocreatine from the tissues and of deuteriocreatinine from the urine. All the deuterium of the isolated choline was shown to be in the methyl groups. After a feeding period of 14 weeks, the methyl groups of the isolated choline, creatine, and creatinine contained 85 percent of the deuterium in the deuteriomethionine fed, thus indicating that the latter substance was the sole precursor of the methyl groups in the diet fed. The transfer of methyl groups from choline to creatine was also demonstrated by the isolation of deuteriocreatine from the tissues and deuteriocreatinine from the urine of rats fed deuteriocholine and homocystine. It is suggested that this ability of choline and methionine to furnish a labile dietary supply of methyl groups explains the action of these compounds in the prevention of fatty infiltration of the liver and hemorrhagic kidneys. "The data support the hypothesis that the body is incapable of generating methyl groups for certain methylations and that methyl groups must be supplied in the diet in a biologically labile form such as occurs in methionine and choline."

The partial replacement of dietary methionine by cystine for purposes of growth, M. WOMACK and W. C. ROSE. (Univ. Ill.). (*Jour. Biol. Chem.*, 141 (1941), No. 2, pp. 375-379, fig. 1).—Growth response of young rats fed diets containing varying proportions of cystine and methionine, but otherwise adequate, indicated that cystine is capable of stimulating growth only when methionine is furnished in suboptimal amounts.

Absence of supplementary relationships in requirements for pyridoxin and essential fatty acids, G. A. EMERSON. (Univ. Calif.). (*Soc. Exptl. Biol. and Med. Proc.*, 47 (1941), No. 2, pp. 445-448).—The possible sparing action of linoleic acid on the pyridoxin requirement or of pyridoxin on the linoleic acid requirement of rats was tested by the feeding of three levels (20, 40, and 80 mg.) of ethyl linoleate in conjunction with two levels (5 and 15 μ g.) of pyridoxin as supplements to a diet of extracted casein 24, sucrose 72, and salt mixture (Mc-

Collum 185) 4 parts, supplemented six times weekly by crystalline thiamin 15, riboflavin 20, and carotene 80 μ g., liver filtrate equivalent to 5 gm. fresh liver, calciferol 12 International Units, and α -tocopherol 0.5 mg. The carotene, calciferol, and α -tocopherol were each fed in 2 drops of ethyl laurate.

The rats on the fatty acid-deficient diet showed the characteristic symptoms and signs of this deficiency. Complete protection against the dermatitis was secured with the smallest (20 mg.) dosage of ethyl linoleate, but growth was stimulated to a greater extent on the larger amounts. Rats on the highest dosage of ethyl linoleate but with no pyridoxin showed the typical acrodermatitis of pyridoxin deficiency. The dermatitis was partially but not completely prevented by 5 μ g. of pyridoxin. Little difference was apparent between the animals receiving the different levels of ethyl linoleate. Growth was limited by the amount of pyridoxin.

It is concluded that the two deficiencies are entirely independent of each other and that the types of dermatitis produced are easily distinguishable.

The dipeptidases of intestinal mucosa, F. B. GAILEY and M. J. JOHNSON. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 141 (1941), No. 3, pp. 921-929).—The crude enzyme used in this study represented a glycerol extract of hog intestinal mucosa obtained by mixing equal volumes of fresh mucosa and pure glycerol at the packing plant; by storing at -8° [C.] for about 10 days, in which time maximum activity was attained and found to be retained even after 50 days; and finally, by centrifuging to remove insoluble cellular material. The extent of hydrolysis of peptides was determined by the acetone-HCl titration method of Linderström-Lang. Largely because of the instability of the dipeptidases in hog mucosa, it was impossible to obtain one or more of them in a state of enzymatic homogeneity. Information was obtained, however, concerning the nature and activation behavior of three dipeptidases of erepsin. An alanyl-glycine-splitting enzyme was not activated by Co^{++} , Mn^{++} , or cysteine, or combinations of these; an enzyme hydrolyzing diglycine rapidly was activated somewhat by Mn^{++} but best by Co^{++} ; and an enzyme hydrolyzing prolylglycine and probably other dipeptides not having an amino group in the *l* configuration was activated by Mn^{++} . Leucylpeptidase was found to be responsible for most of the peptidase activity of dried intestinal mucosa. There was no evidence for the existence of a specific prolinase attacking all propyl peptides.

The coenzyme I content of rat tissues in experimental hyperthyroidism, E. KATZENELBOGEN, A. E. AXELROD, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 141 (1941), No. 2, pp. 611-617).—The coenzyme I content of the tissues was determined by the yeast fermentation method of Axelrod and Elvehjem (*E. S. R.*, 82, p. 727). As compared with normal controls the hyperthyroid rats, fed a ration low in nicotinic acid, showed marked decreases in the coenzyme I content of the tissues; these decreases amounted to as much as 50 and 37 percent in liver and kidney cortex, respectively, when the ration contained no added nicotinic acid. When the nicotinic acid content of the ration was increased to 20 mg. per 100 gm., the coenzyme I content of the tissues of the hyperthyroid rats remained normal. The addition of nicotinic acid did not increase the growth rates of either the control or the hyperthyroid rats.

One hundred studies of the calcium, phosphorus, iron, and nitrogen metabolism and requirement of young women, R. M. LEVERTON, and A. G. MARSH (*Nebraska Sta. Res. Bul.* 125 (1942), pp. 39, figs. 6).—This study was carried out over a 3-yr. period as part of the regional project of the North Central States relating to the nutritional status of college women. Ca, P, Fe, and N metabolism tests of 7 days' duration were conducted, by procedures fully

outlined, on 70 healthy college women between the ages of 18 and 27 yr. living on their customary freely chosen diets. Fifty-three of the individuals were studied once, 7 twice, 7 three times, and 3 four times, making a total of 100 tests. The results, presented and discussed in detail, showed that in the case of each of these elements the lowest retention or the largest negative balance occurred on the lowest intake, and as the intakes rose the negative balances decreased and finally disappeared and the size of the retentions increased. The average daily intakes and the retentions of each of the four elements showed appreciable variations in the 100 tests, averaging, respectively, as follows: Ca, 0.857 (intake) and 0.013 gm. (retention); P, 1.088 and 0.033 gm.; Fe, 10.44 and 1.37 mg.; and N, 9.46 and 0.58 gm. In the 17 individuals, each studied from two to four times, the variations shown by a subject between successive tests were less than the variations between individuals. It was not possible to demonstrate that body size had any effect on metabolism or requirement. On the basis of the percentage of each nutrient retained at different levels of intake, the following recommendations for the "minimum requirement" and the "optimal allowance," respectively, are given: Ca, 0.83 and 1.08 gm.; P, 1.06 and 1.43 gm.; N, 8.15 and 11.34 gm.; and protein (calculated from N), 50.94 and 70.87 gm.

The results of the iron metabolism studies of these young women bear out the earlier conclusion (E. S. R., 86, p. 419) "that if the diet is generous in essential nutrients, other than iron, which have been shown to promote efficient iron absorption and utilization, there will be a sufficient amount of iron to meet daily needs and to replace that lost during menstruation even at as low a level of intake as 7.21 mg. daily."

The iron metabolism and requirement of young women, R. M. LEVERTON and A. G. MARSH. (Nebr. Expt. Sta.). (*Jour. Nutr.*, 23 (1942), No. 3, pp. 229-238).—This is a separate publication of the results of the studies of the Fe metabolism included in the study noted above.

Studies in mineral metabolism with the aid of artificial radioactive isotopes.—VI, Cobalt, D. H. COFF and D. M. GREENBERG. (Univ. Calif.). (*Natl. Acad. Sci. Proc.*, 27 (1941), No. 3, pp. 153-157, fig. 1).—This study is one in the series noted previously (E. S. R., 84, p. 554). Radioactive cobalt, Co^{60} , prepared by bombardment of iron with deuterons was made up, after purification and determination by procedures noted, as a cobalt chloride solution containing 0.1 mg. of cobalt per cubic centimeter. Two 250-gm. male rats were each given 10 μg . of the radioactive cobalt, one by intraperitoneal injection, the other by stomach tube. The animals were then placed on the stock diet, urine and feces were collected separately at regular intervals, and after 96 hr. the animals were sacrificed and the blood, muscle, bone, and various organs were analyzed for their content of radioactive cobalt. The results indicated that 70 percent of the cobalt was eliminated within the first 10 hr. and 90 percent within 2 days. The urine was the chief path of excretion of the injected cobalt, although there was a small but continuous elimination in the feces. About 60 percent of the cobalt given by stomach tube was recovered in the feces, and most of the 40 percent absorbed was rapidly excreted in the urine. Even with the small dose administered less than 5 percent was recovered in the body after 4 days. Spleen, pancreas, kidney, and liver showed relatively high concentrations (5.60, 2.50, 1.89, and 0.67 μg . per 100 gm. dry weight) and bone contained 0.42 μg . per 100 gm. dry weight. It is suggested that the concentration in bone may have some bearing on the polycythemic effect of cobalt, but that the requirement of the tissues for cobalt, if any, must be very small.

The retention and elimination of fluorine in bones, G. E. GLOCK, F. LOWATER, and M. M. MURRAY (*Biochem. Jour.*, 35 (1941), No. 10-11, pp. 1235-1239,

Fig. 1).—Fluorine was determined spectrographically and chemically in human rib bones obtained as autopsy material from subjects dying at different ages from various causes but with no obvious signs of fluorosis. In general the fluorine content of the bones increased with increase of age. The lowest value was 0.02 percent and the highest 0.3 percent. Rats fed small amounts of fluorine from the age of 6 weeks for periods up to 84 weeks showed the concentration in the long bones to increase with age. The uptake was at first rapid and then more gradual, the increase with age apparently following a logarithmic curve. The bones of the fluorine-fed rats were unusually white, thickened, and brittle. After withdrawal of the fluorine from the diet, the elimination from the bones was the inverse of the uptake.

The absorption and excretion of 'minor' elements by man.—I, Silver, gold, lithium, boron, and vanadium, N. L. KENT and R. A. McCANCE (*Biochem. Jour.*, 35 (1941), No. 7, pp. 837-844).—The study involved spectrochemical analyses and prolonged balance experiments with patients and normal persons receiving the minerals in various ways.

"A patient with severe generalized argyria excreted less than 2 mg. of silver per week, all of it in the feces. A patient who had received 550 mg. of gold intramuscularly excreted 6.7 and 9.1 mg. in 2 successive weeks, 78 percent of it in the urine. Soluble lithium salts taken orally by normal persons were rapidly and completely excreted in the urine, but the Li in natural foods was poorly absorbed. Only 25 percent of the Li in a brown bread diet was excreted in the urine. Boron taken by mouth as boric acid was rapidly excreted in the urine. B in foods was much more readily absorbed than Li, 92 percent of it appearing in the urine. Eighty-one percent of the vanadium, which had been administered intravenously as sodium tetravanadate to normal persons in six daily doses, was excreted in the urine by the seventh day after the last injection. Nine percent was excreted in the feces in the same time."

Vitamins, A. G. HOGAN (*Missouri Sta. Bul.* 446 (1942), pp. 15).—Practical information on the chemically identified vitamins is presented in concise form. Nutrients in feedstuffs and foods are first differentiated as the "big things" and the "little things" in nutrition. A tabulation of the vitamins is given, consisting of 11 whose existence is undisputed, of which vitamin A (carotene), B₁ (thiamin), C (ascorbic acid), G (riboflavin), nicotinic acid, and D are classified as of practical importance because many foods contain insufficient amounts of them, and E, K, B₆ (pyridoxin), pantothenic acid, and biotin as of less practical importance because most foods contain adequate amounts. Choline is noted as a substance with many of the characteristics of a vitamin, but which has not been officially classified as such, and inositol and *p*-aminobenzoic acid as compounds concerning the vitamin nature of which there is some evidence, but which have not been extensively investigated. In addition it is thought that at least one and probably several vitamins are in existence but have not yet been recognized. Each of the 14 recognized vitamins is discussed as to symptoms of deficiency in various species, stability, and general destruction.

Concerning the provision of vitamins to meet human needs, the author steers a middle course between the extremes of complete indifference to their provision in the diet to undue concern that each meal should provide its mathematical quota of any vitamin. "Either extreme is to be avoided. A more reasonable attitude is to adopt a flexible but consistent daily dietary regimen that includes approved quantities of the protective foods." As for the use of pure vitamins and vitamin mixtures, it is emphasized that they "have their proper place, if taken under the guidance of a dietitian or physician. They may be helpful to many individuals with bad food habits, but they are not a

substitute for proper food, and they cannot be depended on to maintain optimum health."

Where to get the vitamins and minerals important in human nutrition, W. ARMSTRONG (*Oklahoma Sta. Cir. 100 (1942), pp. 11*).—In this nontechnical publication information on the vitamins is tabulated as to properties, functions in the body, conditions in man caused by lack of the vitamin or cured by feeding it, and best plant and animal sources. The sources are listed in decreasing importance of the food as a source of the vitamin in question as calculated from the approximate potency of an average serving. Minerals, tabulated in a similar manner, include calcium, iron, phosphorus, copper, and iodine. Information is also tabulated on conditions which may increase an individual's need for food nutrients, with checks against the separate vitamins, protein, and minerals (not differentiated).

The human excretion of carotenoids and vitamin A, G. WALD, W. R. CARROLL, and D. SCIARRA (*Science, 94 (1941), No. 2430, pp. 95-96*).—From observations reported in the literature on the relative potency of carotene and vitamin A for rats and from a series of studies here reported on human subjects with determinations of carotene, xanthophyll, and vitamin A in feces on unrestricted diets and on diets high and low in one or more of these factors, the authors suggest that "due to its low apparent absorption, carotene in human bio-assay should be at best only about 40 percent as effective as an equal weight of vitamin A, and should possess only about two-thirds the potency now assigned to it on the basis of rat assays." The report of Booher et al (*E. S. R., 83, p. 278*) is thought to afford some confirmation of this conclusion. The fact that in rats the different potencies of β -carotene and vitamin A are explained by their differential absorptions is considered to imply that following absorption they are about equally effective. On the assumption that β -carotene is converted into vitamin A in vivo by symmetrical cleavage, 1 molecule of carotene yielding 2 molecules of vitamin A, carotene and vitamin A should be about equally potent in vivo following absorption. The present experiments are considered to indicate a similar possibility in man.

Inadequacy for mice of a synthetic diet supplemented with all known vitamin B factors, E. TROESCHER-ELAM and H. M. EVANS. (*Univ. Calif. et al.*). (*Soc. Expt. Biol. and Med. Proc., 48 (1941), No. 3, pp. 549-555, fig. 1*).—Young mice on a diet containing extracted casein, sucrose, salts, cod-liver oil, corn oil, and butterfat and supplements of pure thiamin chloride, riboflavin, pyridoxin hydrochloride, nicotinic acid, calcium pantothenate, choline hydrochloride, ascorbic acid, inositol, and *p*-aminobenzoic acid grew at a good rate, but after some weeks the fur was not consistently clean. Increasing the casein and salts or doubling the quantity of vitamin supplements had no effect on growth or the condition of the fur, but growth was increased and the condition of the fur improved by feeding fresh beef liver and to a less degree by a concentrate of a liver extract, the preparation of which is described. Pimelic acid as an additional supplement was without effect.

Studies on the rat growth assay method for riboflavin, H. R. STREET (*Jour. Nutr., 22 (1941), No. 4, pp. 399-408, fig. 1*).—In the method described the B vitamins other than riboflavin are supplied by aqueous rice bran extract, which is given at standard time intervals. The riboflavin content of the materials being tested is calculated from the effective gain, this being the gain of a group receiving the unknown material minus the gain of a similar control group. The technic is described in detail, and data are given on seasonal variations in results, the validity of the procedure, and on analyses of wheat extract as a source of the B complex. With the diet and procedure as described, the relation

between the growth response, expressed as effective gain, and the dose of riboflavin is linear. The bran extract is considered preferable to the wheat extract used in the Bourquin-Sherman rat growth method, as the latter does not furnish the other B vitamins in adequate amounts.

A riboflavin excretion test as a measure of riboflavin deficiency in man, V. A. NAJJAR and L. E. HOLT, JR. (*Bul. Johns Hopkins Hosp.*, 69 (1941), No. 5, pp. 476-481).—In a volunteer subject on a riboflavin-free dietary regime for 30 days it was observed that the urinary excretion of flavin, as determined by the fluorometric method of Najar, noted on page 621, fell to zero on the sixteenth day, and despite the fact that the diet was continued without alteration for another 2 weeks, no symptoms of ariboflavinosis developed. It was considered, therefore, that the 24-hr. urinary output of riboflavin was not an accurate measure of riboflavin deficiency, since only the immediate dietary intake was reflected. A test which appeared to correlate more closely with clinical riboflavin deficiency was one employing an intravenous injection, following an overnight fast, of 1 mg. of riboflavin dissolved in distilled water. Excretion in the urine was determined for a control period of 1 hr. previous to the injection and followed for half-hourly and then hourly periods for 4 hrs. In this test a group of 10 normal subjects showed a marked excretion in the first half-hour, with a sharp decrease in the second half-hour, and an approach to the preinjection level by the end of the fourth hour; from 32 to 72 percent of the injected dose was retained in the body. In contrast the excretion of riboflavin in the urine of 4 subjects showing clinical symptoms of an induced riboflavin deficiency was strikingly less, even in the initial half-hour period, and from 81 to 93 percent of the injected dose was retained in the 4-hr. test.

The riboflavin content of cereal grains and bread and its distribution in products of wheat milling, J. S. ANDREWS, H. M. BOYD, and D. E. TERRY (*Cereal Chem.*, 19 (1942), No. 1, pp. 55-64, fig. 1).—The microbiological method employed for the assay of riboflavin (see page 621) was essentially that of Snell and Strong except that the extracts were prepared by autoclaving the samples with water and digesting the resulting suspensions with takadiastase. Values obtained for each of the six varieties of spring wheat, as grown in four different locations, showed averages by varieties to range from 1.06 to 1.32 $\mu\text{g.}$ per gram, while averages by regions ranged from 1.17 to 1.23 $\mu\text{g.}$ per gram. These results suggested differences due to variety but not to environment. In contrast, earlier tests with these same samples had shown that the thiamin content was influenced by environment, while differences between varieties were insignificant (E. S. R., 87, p. 604). Values ranging from 1.00 to 1.30 $\mu\text{g.}$ per gram and suggesting neither varietal nor environmental differences were obtained for another series of samples, including varieties of soft wheats and hard winter wheats. Analyses of several varieties each of barley, oats, rye, yellow corn, and white corn, giving respective averages of 1.21, 1.30, 1.43, 1.40, and 1.38 $\mu\text{g.}$ per gram, showed these grains to be quite similar to wheat in riboflavin content.

Values obtained from analyses of the products separated in the milling of wheat showed that about two-thirds of the total riboflavin was contained in the feeds—red dog, bran, and shorts. Patent flour (65 percent extraction) contained about 0.94 $\mu\text{g.}$ riboflavin per gram as compared with 1.00 $\mu\text{g.}$ per gram in the wheat from which it was milled. A series of breads made from patent flour, from the same supplemented with riboflavin, and from whole wheat flour showed no measurable loss of riboflavin during the process of their production, but large losses occurred when slices of bread were unduly exposed to the light. These losses in white bread (up to 50 percent) were much greater than in dark bread (up to 10 percent) and suggested the importance of carrying

out drying operations in the dark in the preparation of bread samples for analysis.

Failure to cure or prevent graying of rats with *p*-amino benzoic acid, G. A. EMERSON. (Univ. Calif.) (*Soc. Expt. Biol. and Med. Proc.*, 47 (1941), No. 2, pp. 448-449).—The claim of Ansbacher (E. S. R., 86, p. 711) that graying of the fur of rats can be cured or prevented by *p*-aminobenzoic acid was tested by attempts (1) to cure by the administration of *p*-aminobenzoic acid the graying produced by a diet furnishing all of the recognized B vitamins except pantothenic acid and (2) to produce the graying by the use of the Ansbacher ration. In the first series *p*-aminobenzoic acid was without effect either as a growth stimulant or in curing the graying, while calcium pantothenate caused a marked darkening of the fur in the presence or absence of *p*-aminobenzoic acid. In the second series graying appeared in none of the animals even after 2 mo. on the diet, a time sufficient to cause graying in the absence of pantothenic acid.

Ascorbic acid content of five quick-frozen vegetables as affected by composition of cooking utensil and volume of cooking water, J. A. MCINTOSH, D. K. TRESSLER, and F. FENTON. (N. Y. State Expt. Sta.). (*Jour. Home Econ.*, 34 (1942), No. 5, pp. 314-318).—Quick-frozen brussels sprouts, cauliflower, lima beans, peas, and spinach were boiled in different amounts of water within the limits of household practice in covered and uncovered stewpans of aluminum, enamel, Pyrex, and stainless steel. Vitamin C, including ascorbic and dehydroascorbic acid, was determined by a modified Bessey and King (E. S. R., 71, p. 137) procedure in the uncooked and cooked frozen vegetables and cooking water. In these tests the composition of the cooking utensil was found to have very little effect on the ascorbic acid content of the boiled quick-frozen vegetables, and with few exceptions the retention was the same whether the boiling was in covered or uncovered utensils. In the several tests, from 12 to 15 percent of the ascorbic acid was leached from brussels sprouts, from 23 to 29 percent from cauliflower, from 20 to 28 percent from peas, from 24 to 28 percent from spinach, and from 31 to 36 percent from lima beans.

The ascorbic acid content of dried vegetables, V. A. BECKLEY and V. E. NOTLEY (*Biochem. Jour.*, 35 (1941), No. 12, pp. 1396-1403).—This work was carried out in Kenya, Africa, with vegetables grown in the highlands. Immediate drying following harvest, the use of sharp knives of stainless steel, and the maintenance of drying loads sufficiently light to prevent a drop in the temperature (55°-70° C.) of the tunnel drier were found to be essential. Ascorbic acid analyses of the raw material were used as a guide in selecting the most desirable maturity or the most suitable portions of the vegetable for drying.

Cabbage, including the outer green leaves if sufficiently tender, was cut in shreds from $\frac{1}{4}$ to $\frac{1}{2}$ in. wide. Blanching preliminary to drying was not recommended, since it resulted in a product which, although richer in vitamin C than the unblanched, dried product, was unpalatable and unattractive after soaking and cooking (30 min. at an altitude of 5,800 ft.). Cooking losses were kept at a minimum by dropping the dried shreds directly into boiling water. Cauliflower, including a fair proportion of the outer leaves, was sliced and blanched preliminary to drying. Without blanching to soften the tissues, drying was too prolonged and bacterial spoilage developed. Carrots were sliced and dried without blanching, since blanching was found to give low yields and a cooked product very flat as to flavor. String beans, not too mature, were cut into strips and dried without blanching, and the dried product was cooked without pre-soaking by dropping directly into boiling water; blanching was found to reduce the yield and ascorbic acid content and to give a dried product of unsatisfactory color and a cooked product unsatisfactory as to color, tenderness, and flavor.

Potatoes cut into thick chips and blanched for 3 min. in live steam gave a very satisfactory dried as well as cooked product. The dried material held in an open bag for 7 mo., part of which time it was very wet, remained hard and cooked up perfectly.

Effect of blanching on the dehydration rates of vegetables, J. SUGIHARA and W. V. CRUESS. [Univ. Calif.]. (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 21 (1942), No. 5, pp. 139-140, figs. 2).—A number of vegetables were dried, both with and without blanching, in a small air-blast tunnel dehydrator, with air velocity of about 500 linear ft. per minute and low relative humidity, at temperatures varying for the several products from 140° to 160° F. The yield of dried product obtained from the blanched vegetable was higher than from the unblanched in the case of spinach, peas, onions, and corn; the reverse was true for cabbage, string beans, sauerkraut, carrots, potatoes, squash (summer and Zucchini), cauliflower, and beets. In all cases the blanched vegetable dried more quickly than the unblanched, the saving in time being appreciable with cauliflower, peas, and string beans. The sauerkraut, after drying, was gray in color, but on refreshing and cooking returned to the normal color and appearance of sauerkraut. Drying made it milder than regular cooked sauerkraut in flavor and odor.

TEXTILES AND CLOTHING

Textile fabrics and their selection, I. B. WINGATE (*New York: Prentice-Hall, 1942, rev. ed., pp. XV+624, figs. [78]*).—This book, one in a series consisting of several independent studies of the various phases of retailing, treats comprehensively of the question of textiles from the consumer point of view, with the purpose of presenting the facts about textiles that make for satisfaction in use. "It outlines pertinent facts that will guide the customer in making the best selection for his or her needs; it interprets, for the consumer-buyer, the terms found on tags and labels affixed to textile fabrics sold in stores, as well as the terms found in factual advertisements; and, finally, it emphasizes the selling points of textile fabrics that will make a retail salesman more intelligent." The first part, dealing with consumer demand and fabric construction, considers the consumer movement and what the consumer wants to know about textiles; the classification and recognition of textile fabrics; the importance to the consumer of cotton, linen, rayon and nylon, silk, and wool; plain and fancy weaves; knitted cloth; and the finishing, dyeing, and printing of cloth. The second part, dealing with the selection of appropriate fabrics, considers the points involved in the selection for women's, girls', and infants' wear; men's and boys' wear; domestics; period styles in home furnishings and rugs, and for draperies, curtains, and upholstery. In the appendix are given the Federal Trade Commission Trade Practice Rules for the rayon industry, shrinkage of woven cotton yarn goods, the silk industry, the linen industry, the hosiery industry, and rules and regulations under the Wool Products Labeling Act of 1939. An extensive bibliography refers to general and specialized works on textiles, to periodicals, and to general sources of information for consumers and salespeople.

Textile photomicrographs made at low power by fluorescent light, H. H. BROADFOOT and E. R. SCHWARZ (*Textile Res.*, 12 (1942), No. 6, pp. 2-6, figs. 4).—It is pointed out that fluorescent lighting possesses the advantages of even illumination, prevention of heating of the sample, control of surface lighting in the matter of shade and shadow, short time of exposure, and considerable reduction in cost of equipment. It is recommended in textile photography where high magnification is not required, such as in showing details of construction,

defects in manufacture; and results of service or of tear, bursting, impact, or tensile strength tests.

Research aids: Air permeability instrument (*Textile Res.*, 12 (1942), No. 7, pp. 20-22, figs. 2).—The improved instrument, described and illustrated, was developed at the National Bureau of Standards by H. F. Schiefer and P. M. Boyland. It permits a determination to be made on any part of a piece of cloth without cutting. Having been found entirely satisfactory in routine use, it is recommended for testing parachute cloth, fabrics for wind-resistant clothing, blankets, etc. In the test the fabric is held firmly over a very small opening mounted in a table top. Air is drawn, at a rate which may be adjusted, through the fabric into a chamber connected with a horizontal manometer for measuring the pressure drop across the fabric and through an orifice for measuring air flow into a chamber connected with a vertical manometer. The amount of air flowing through a fabric under test is determined from the pressure drop indicated by the vertical manometer and the calibration of the orifice which is used. A set of nine orifices covers the range of air permeability from 1 to 700 cu. ft. per minute per square foot of fabric. The air permeability is usually measured for a pressure drop across the fabric of 0.5 in. of water. The appropriate size of the orifice to use for a fabric, the approximate permeability of which is not known, is determined by a trial run. The pressure drop indicated by the vertical manometer should be more than 3 in. If it is less, a smaller orifice should be used to obtain precision in the instrument.

Sequoia bark fibers (*Textile Res.*, 12 (1942), No. 4, pp. 26-27, fig. 1).—This brief report concerning a product developed through research indicates that the short sequoia bark fibers that collect separately from the long ones used in making an insulating material can be blended with wool, and that the resulting blend can be carded, combed, and spun into yarns suitable for the manufacture of woven or knitted fabrics resembling all-wool materials in appearance and handle. The blended fibers can also be made into felts.

Synthetic-rubber thread (*Textile Res.*, 12 (1942), No. 7, pp. 18-19, fig. 1).—The development by a commercial rubber firm of a synthetic rubber thread is announced. At present the entire supply is restricted to military uses. In rigorous tests the synthetic rubber thread showed 700 percent elongation, comparable to the rubber thread previously made from natural rubber compounds; the recovery from stretch was about the same; and the stability under accelerated aging tests was somewhat better than that shown by thread from natural rubber. Synthetic thread resisted the effects of dyeing or bleaching and the action of perspiration much more than did the natural rubber products and had a much greater resistance to cutting by the needles of the knitting machines.

Two-way stretch (*Textile Res.*, 12 (1942), No. 6, pp. 18-21, figs. 2).—A brief outline is given of the research leading to the development of elastic yarns or threads of such fineness that they could be knit on fine-gage machines or woven into sheer fabrics. Processes involved in the manufacture of the several types of elastic yarns are noted briefly, and applications in the textile industry are cited.

Determination of Aralac (*Textile Res.*, 12 (1942), No. 6, pp. 24-25, fig. 1).—The tentative method proposed for the determination of Aralac (casein fiber) in admixture with wool, viscose rayon, acetate rayon, or cotton is based upon the determination of phosphorus in an acid digest of the fabric sample. Of these fibers Aralac alone contains phosphorus. The percentage of this element as determined is calculated directly to percentage of Aralac on the basis of a phosphorus content of the fiber of 0.82 percent. The method is not suitable for a determination of Aralac in admixture with rabbit fur.

HOME MANAGEMENT AND EQUIPMENT

Food habits of consumer groups in small towns of Alabama that affect farmers' markets, J. H. BLACKSTONE and B. T. INMAN (*Alabama Sta. Bul.* 252 (1942), pp. [1]+68, figs. 7).—This survey of the amount of food consumed, produced, and purchased by representative groups of people in three small Alabama cities—Hartselle, Notasulga, and Andalusia—was undertaken in the interest of helping local farmers adjust their production of food, as a possible cash crop, to the local market demand in effective price and quality competition with distant producers. The survey, considered in some detail, showed that the respective yearly per capita consumption was for the three towns 1,460, 1,447, and 1,281 lb.; 74, 60, and 85 percent of the food was purchased, most of the rest being produced at home; the food purchases in Andalusia varied with the income of the consumer groups from a yearly per capita of 700 lb. in the lowest income group to 1,500 lb. in the highest; more than four-fifths of the purchased vegetables and all of those home-produced were in the fresh form; of fruits and nuts, which tended to be luxury foods, about 85 percent were purchased, and about half of the kinds were unadapted to production in the State; per capita consumption of livestock products and fish was greater than for any other group of foods; and miscellaneous products, notably flour, were largely bought from distant sources. The findings of this survey considered in relation to the local farm production situation suggested that farmers might profit by planning to produce, with the least interference to major cash crops, those crops and livestock products most in demand by consumers; by adapting packaging, grading, and pricing to local demands; by adjusting production and storage schedules to have a large amount of produce for sale when the local supply is low, but to maintain market contacts and customers throughout the year; by dealing frankly and considerately with the stores; and by establishing additional market facilities such as roadside stands and curb markets.

[Equipment studies by the Indiana Station] (*Indiana Sta. Rpt.* 1941, pp. 76-77, fig. 1).—This progress report (E. S. R., 86, p. 142) summarizes an extension of studies by G. M. Redfield and R. L. Witz of equipment and methods for freezing and storing farm produce, and by Redfield and O. D. Milligan of small electric mixers and beaters for household use.

Family finance in wartime: Home economists' responsibilities, J. V. COLES. [Univ. Calif.]. (*Jour. Home Econ.*, 34 (1942), No. 3, pp. 149-154).—This paper summarizes briefly the financial situation of the family as affected by the present changes in income, increase in prices, decrease in goods available, demands for wartime savings and taxes, and preparation for postwar finances; and discusses ways of meeting this situation through adjusting consumption spending wisely, controlling finances carefully, and buying efficiently and with regard to protecting consumer interests. Some specific suggestions are made to home economists for ways of meeting the responsibilities imposed by this situation.

Physical properties of certain all-silk and all-rayon dress fabrics, E. E. STOUT and H. FLETCHER. (Kans. Expts. Sta.). (*Jour. Home Econ.*, 34 (1942), No. 4, pp. 245-251).—This study, presented in some detail as to materials, methods, and results, is summarized as follows:

"Pure-dye silks are not invariably superior to the rayons, as many persons believe. The weave has something to do with how much punishment a fabric can take. Among the satin crepes tested in this study silk forged ahead in average breaking strength. But among the flat crepes, acetate rayon was in the lead; and among the taffetas, viscose rayon. Dry cleaning neither weakened the fabrics nor caused excessive shrinkage."

MISCELLANEOUS

Report on the agricultural experiment stations, 1941, J. T. JARDINE, H. L. KNIGHT, ET AL. (U. S. Dept. Agr., Off. Expt. Stas., Rpt. Agr. Expt. Stas., 1941, pp. 128).—This report is discussed editorially on page 613.

High lights in agricultural research in Idaho: Forty-ninth Annual Report [of Idaho Station] for the year ending December 31, 1941, C. W. HUNGERFORD ET AL. (Idaho Sta. Bul. 244 (1942), pp. 64, fig. 1).^{*}

Research solves farm problems: Fifty-fourth Annual Reports of [Indiana Station], 1941, H. J. REED, W. V. LAMBERT, ET AL. (Indiana Sta. Rpt. 1941, pp. [2]+114, figs. 11).^{*}

Fifty-fourth Annual Report of the [Michigan Station], 1941, V. R. GARDNER (Michigan Sta. Rpt. 1941, pp. 103-118).—This consists mainly of lists of publications and projects.

Report of the Puerto Rico Experiment Station, 1940, [A. LEE] (Puerto Rico Sta. Rpt. 1940, pp. II+103, pl. 1, figs. 38).^{*}

The San Jóaquin Experimental Range, C. B. HUTCHISON and E. I. KOTOK (California Sta. Bul. 663 (1942), pp. 145, pls. 2, figs. 19).—Following an introduction and a description of the experimental area, the latter by M. W. Talbot, J. W. Nelson, and R. E. Storie, six papers are presented as noted elsewhere in this issue.

Notes on conservation in the Americas, H. J. COOLIDGE, JR. (Chron. Bot., 7 (1942), No. 4, pp. 155-163, fig. 1).—This article, on the conservation of natural resources, includes plants and animals, the physical aspects, and the population with its general distribution and its probable distribution and land uses in the years to come. With the exception of Mexico, it excludes North America from consideration.

Resefia agrícola del Ecuador [Conspectus of the agriculture of Ecuador], E. MOLESTINA O (Chron. Bot., 7 (1942), No. 4, pp. 167-169).

Catalogo de publicaciones periodicas científicas y técnicas [Catalog of scientific and technical periodical publications] (Buenos Aires: Soc. Oient. Argentina, 1942, pp. XX+342).—This is a union list of the periodicals received in the libraries of 64 Argentine institutions.

^{*}The experimental work reported is for the most part referred to elsewhere in this issue.

NOTES

Colorado Station.—A portable dehydrator is being built for experiments with fruits and vegetables. The cost is about \$100, and it is believed to be practicable for family use.

Iowa Station.—A 480-acre farm near Crystal Lake in Hancock County has been purchased for experiments on peat land. The work is expected to deal largely with vegetable crops.

Indiana Station.—Efforts are being made to increase the menthol content of domestic peppermint oil, mainly produced in Indiana and Michigan. In the past menthol recovery has not been attempted in this country, and about 500,000 lb. have been imported annually from Japan.

Experiment Station Seed Shipments to Russia.—According to an announcement by Russian War Relief, Incorporated, a shipment by airplane of new varieties of disease-resistant seeds contributed by experiment stations in this country and Canada has been received in Moscow by the Lenin All-Union Academy of Agricultural Sciences. The shipment includes the more familiar grain and vegetables of Russia—wheat, oats, barley, tomatoes, carrots, beets, cucumbers, cabbage, and corn—and a few vegetables hitherto little cultivated there—spinach, collards, celery, peas, squash, and eggplant. The stations accredited with the various seeds are as follows: California, Connecticut [New Haven], Indiana, Kansas, Massachusetts, Michigan, Minnesota, New Jersey, [New York] Cornell, Ohio, Tennessee, Virginia Truck, Washington, Wisconsin, and Saskatchewan.

Agricultural Engineering Research in Great Britain.—An Agricultural Machinery Development Board set up early in 1942 has established a National Institute of Agricultural Engineering at Askham Bryan, near York. The nucleus of the institute is the Institute of Research in Agricultural Engineering, transferred from Oxford by the university and with its director, S. J. Wright, continuing in charge. Temporary housing in the new location will be provided in buildings belonging to the Yorkshire Council for Agricultural Education, but eventually it is intended to build permanently on a nearby site. The main functions of the new institute will be to act as a general clearing house for information about agricultural machinery and its use, to carry out tests or demonstrations of new or improved implements, and to undertake experimental and demonstration work on the better utilization of existing equipment.

New Journals.—*Agenda*, a quarterly journal of reconstruction, has been begun by the London School of Economics and Political Science at Southfield House, Hill Top Road, Oxford. The initial number included an article by the late Sir Daniel Hall entitled *Reconstruction and Agriculture* (pp. 12–25) and one by Dr. L. Dudley Stamp on *Principles of Land Utilization* (pp. 25–37).

Bibliography of Agriculture is being issued monthly, by the U. S. D. A. Library, in four sections. Section A, *Agricultural Economics and Rural Sociology*, supersedes *Agricultural Economics Literature*; Section B, *Agricultural Engineering*, supersedes *Current Literature in Agricultural Engineering*; Section C, *Entomology*, supersedes *Entomology Current Literature*; and Section D, *Plant Science*, supersedes *Plant Science Literature*.

EXPERIMENT STATION RECORD

VOL. 87

DECEMBER 1942

No. 6

RESEARCH AT THE SECOND INTER-AMERICAN CONFERENCE OF AGRICULTURE

The 12 years which have elapsed since the holding of the First Inter-American Conference on Agriculture, Forestry, and Animal Industry in Washington, D. C. (E. S. R., 63, p. 603) have seen notable progress in the mobilization of agriculture in the Americas. This advance was well brought out in the proceedings of the second conference, held in Mexico City from July 10 to 16, 1942. This conference gave many evidences of an ever-widening appreciation of the value of joint effort and close cooperation.

In spite of transportation difficulties and an advancement of the date by several months to spur concerted action, all of the 21 Republics were represented at the sessions. Among the 170 delegates in attendance were five ministers or secretaries of agriculture and an equal number of national directors of agriculture. The delegation from the United States was headed by Secretary Claude R. Wickard, who served as a vice chairman, and included a considerable number of specialists from the Department and the land-grant institutions.

An address by Secretary Wickard at the opening plenary session took the form in large part of a report to the hemisphere on the war effort of the United States as regards agriculture. He advocated as measures worthy of consideration by the conference the establishment of cooperative agricultural experiment stations, agreements or contracts to increase production of strategic commodities, improvement and integration of communications, plans for farm and industrial labor, common management of surpluses, provision for relief after the war, finding ways of distributing maximum production to the people, raising more crops for home consumption, and the strengthening of our competitive positions as a hemisphere by better production methods, higher yields, mechanization, improved transportation, and new processing technics. In conclusion he offered "both for the present and the future" the services of the Department to other nations and especially those of the Western Hemisphere through "its scientists,

economists, engineers, and technicians, and the facilities of its laboratories and experiment stations."

The work of the conference was carried on in 12 subject-matter sections, before which about 70 papers were presented. Of these sections, that on education and research centered around topics of direct interest to readers of the *Record*, but there was also much of significance in other sections. Thus the section on products of present-day importance recommended the establishment of cacao institutions in Ecuador and other countries. That on rural organization advocated an integrated system of rural education and the inclusion of home economics instruction and research in colleges of agriculture. The section of soils and agronomy discussed the organization of a hemisphere soil society, standardization of terminology, and the making of a hemisphere soil map. A resolution of the entomology and plant pathology section recommended parallel and coordinated investigations of insects, and the section of climatology suggested close cooperation between phytophysiolologists, phytopathologists, and agrologists on the one hand and meteorologists and climatologists on the other. The forestry section advocated the strengthening of forestry education and research. The program of the section on chemistry and technology, dealing with the need both for adapting agricultural products for new uses in the war effort and for utilizing normal surpluses, centered around research in these lines and led to a resolution urging its continuance and upbuilding.

The section on education and research gave much attention to problems of tropical America and inter-American collaboration in agricultural research and extension. Resolutions were adopted recommending the exchange of information concerning scholarships available in the respective countries, the publication of an inter-American agricultural magazine, and the establishment of cooperative agricultural experiment stations, and endorsing the Inter-American Institute of Agricultural Sciences. The program of this proposed institute was explained by Dr. E. N. Bressman, who since the conference has been named as its first director. Costa Rica has been selected as the site of the institute, and its object has been announced as "the advancement of agriculture in the American Republics through teaching, research, experimentation, extension activities, general education, and training in agriculture and related arts and sciences."

For obvious reasons many of the papers at the conference dealt with specific crops and situations, but that entitled Agricultural Science and the People's Welfare, by Dr. E. C. Auchter, head of the Agricultural Research Administration, was conspicuous for its discussion along general lines of research ideas and ideals. Our duty as agricultural scientists, he declared, is threefold: "First, to keep on

everlastingly seeking for more of the truth, each of us in that field in which our particular work lies; second, to see to it that whatever truths we discover become as widely known as possible; and third, to advance the use of these truths for human well-being." Pointing out the huge task now faced by agricultural science and the need for maximum efficiency, he pleaded first of all for a critical study of our research procedure to see where we can "cut corners wherever possible, eliminate slow and cumbersome procedures that have grown up as agricultural science became divided into more and more special compartments, and bring people together for quick, common action. . . . We cannot afford to be slow in meeting the problems of human welfare that face us all with increasing urgency."

At the same time he maintained that in connection with war work, "the research worker must do more than follow the trends of current events; he also has a responsibility as a leader who looks ahead. Where scientific work is closely and directly tied up with the public welfare, as ours is, this responsibility is especially great. If we exercise it wisely, we can be sure of public approval in the long run."

Closely related to the "need to carry along certain projects whether or not they seem to have immediate value," is, according to his view, the question of "basic research." Citing several instances in which it was found that "either basic research precedes the practical applications of science or a certain amount of this kind of research is found to be necessary somewhere along the line to clear up obscurities that block further progress," he made the point that "in research there is no single road to practical results. If we keep our eyes constantly and exclusively on what seem to be immediate needs, we miss some of the richest fruits of scientific work—the fruits that grow from the discovery of important fundamental facts." For these reasons, freedom of inquiry "to explore all kinds of facts wherever they may lead is absolutely necessary if science is to advance human welfare."

The larger aspects of the conference as a whole were well summarized at its close in a statement by Secretary Wickard in which he said in part, "the Second Inter-American Conference of Agriculture impressed me as a demonstration of the will of the people of the Americas to live and work together. Of greatest immediate importance, naturally, are the steps that were taken to make available agricultural products essential in carrying on the war. In addition, the conference lost no opportunity to encourage projects that will have a long-time effect." Undoubtedly the conference measurably advanced both types of programs. Especially noteworthy and encouraging was its recognition of research as an indispensable aid.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical investigations by the Arizona Station] (*Arizona Sta. Rpt. 1941*, pp. 6-7, 40-42).—Fluorine investigations included work on the bone filter, removal of stain from mottled teeth with hydrogen peroxide, and relation of well depth to the fluorine content of the water. Work on the chemical composition and carotene content of Arizona forage plants and on blood analysis of cattle is also briefly discussed.

[Chemical investigations by the New Haven Station] (*Connecticut [New Haven] Sta. Bul. 452 (1942)*, pp. 7-9).—H. B. Vickery et al. report upon studies of plant organic acids; proteins and amino acids, noting a reinvestigation of the crystalline proteins of some of the cucurbits, a new method for the preparation of histidine, and the commercial application of a method for preparing the amino acid amide glutamine; and protein nutritional investigations with the globulin of watermelon seed.

[Chemical investigations by the Florida Station] (*Florida Sta. Rpt. 1941*, pp. 84-86, 122-126, 128-130, 153-156).—Brief reports by A. L. Stahl, J. C. Cain, J. R. Henderson, G. M. Volk, L. H. Rogers, R. A. Carrigan, C. E. Bell, H. W. Winsor, R. C. Hughes, C. K. Clark, F. F. Cowart, and C. R. Stearns, Jr., include a study on the preservation of citrus juices and pulps; storage and preservation of miscellaneous fruits and vegetables with phtofilm, ultraviolet light, and brine; citrus maturity studies; soil and plant relationships; physical and chemical methods of complete and partial analysis for soils and related materials; a study of the so-called "quick methods" for determining soil fertility; composition of Florida soils; effects of certain mineral elements on plant growth, reproduction, and composition—chemical phase; packing house research; effect of washing on shrinkage and stem-end control in oranges; studies on maturity and quality standards of oranges; and added color research.

[Chemical and bacteriological investigations by the Massachusetts Station] (*Massachusetts Sta. Bul. 388 (1942)*, pp. 19-20, 29-31, 71-74).—These included a comparative study of certain media employed for fecal-flora studies, by J. E. Fuller and I. Fried; the bacteriology of chocolate sirups, cocoa powders, and chocolate milk, by Fuller, R. W. Swanson, and W. S. Mueller; studies of methods for determining the sanitary quality of drinking utensils, by R. L. France, W. E. Cassidy, and Fuller; the effectiveness of certain detergents and procedures employed for the cleansing of eating and drinking utensils, by France; lignin and its relation to the absorption of minerals by plants and chemical investigation of the onion, both by E. Bennett; chemical changes in the cooking quality of vegetables and investigations on the nutritive value of fishery products as human and animal food, both by M. E. Freeman and W. S. Ritchie; physicochemical properties of starches, by Freeman; cranberry products research, by C. R. Fellers and A. S. Levine; apple products, including apple juice, by W. B. Esselen, Jr., Levine, Fellers, and C. C. Strachan; fruit jellies and jams, by Levine, S. G. Davis, and Fellers; vitamin C content of catsup, by Esselen and H. Fran; change in oxida-

tion-reduction potential in packaged fruit juice, by Esselen; glass container research, by Fellers, Esselen, W. H. Fitzpatrick, E. L. Moore, and J. J. Powers; crab meal research, by Fellers and J. Lubitz; dextrose investigations, by Fellers, Levine, and L. Tarkow; and preservative values of organic acids, by Levine, R. E. Morse, and M. G. O'Connor.

Insistimos en el problema de las grasas [The urgency of the fat problem], J. H. RAMÍREZ (*Agr. Expt. [Puerto Rico Univ. Sta.]*, 2 (1942), No. 3, p. 3).—A plea for additional research on fats and oils.

A support for reflux condensers, E. J. BENNE. (*Mich. Expt. Sta.*). (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 3, p. 264, figs. 4).—The author describes and illustrates a device providing sufficient elasticity in the mounting to permit vigorous rotation of the attached flasks without need to loosen clamps. A support for six reflux condensers was constructed from common materials at slight cost and proved to be convenient and effective in use with either a water bath or electric hot plate.

Spectrophotometric determination of iron.—I, Use of mercaptoacetic acid; II, Use of 2,2'-bipyridine, R. A. KOENIG and C. R. JOHNSON (*Jour. Biol. Chem.*, 142 (1942), No. 1, pp. 233-238; 143 (1942), No. 1, pp. 159-163).—The present studies were "designed to adapt for spectrophotometric use a number of the best colorimetric methods for iron, to obtain accurate calibration data over a wide range of iron concentrations, and to establish the validity of these data for determining iron in solutions containing common acids in concentrations that occur in analytical solutions prepared by various wet and dry methods of ashing." Details are given as to apparatus and reagents, the calibration experiments are summarized, and the procedures are given in detail for accurate spectrophotometric methods for determining iron with mercaptoacetic acid and with 2,2'-bipyridine.

Determination of iron in three diets, R. A. KOENIG and C. R. JOHNSON (*Food Res.*, 7 (1942), No. 2, pp. 130-134).—Three different diets were carefully analyzed for iron content by seven different methods of procedure, involving determinations by the ferron, mercaptoacetic acid, and α,α' -dipyridyl methods and dry and wet ashing procedures. Further variations were introduced in the case of the wet ash method by utilization of the acid digest (1) directly, after some concentration; (2) after evaporation to dryness and subsequent bleaching treatment; or (3) after evaporation and subsequent electrical ignition. The procedure applied in the two latter cases was conducted with or without hydrolysis to convert pyrophosphate to orthophosphate.

The results indicated that essentially correct values for total iron were obtained by both the ferron and mercaptoacetic acid methods when the sample was digested by the wet ashing procedure, provided, in the ferron method, care was taken to hydrolyze pyrophosphate. In the mercaptoacetic acid method, the presence of the ortho- and pyrophosphate could, in most cases, be disregarded. Slightly low values were obtained by procedures involving ignition due probably to volatilization of iron. While wet ashing was preferable, organic matter resisting attack by the acid mixture had to be destroyed eventually for determination of total iron. Results obtained by direct utilization of the acid digest ((1) above) showed that even after perchloric acid ashing a considerable part of the iron did not react when the usual colorimetric methods were applied; this and the nature of the residue obtained upon evaporation to dryness suggested that a portion of the iron was held in firm organic combination. It was concluded tentatively that direct determinations on the acid digest may give a measure of available iron. Analyses by the dipyridyl method supported this conclusion.

Distribution of salt in butter: A volumetric micromethod, C. L. OGG, I. B. JOHNS, W. H. HOECKER, and B. W. HAMMER. (Iowa Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 3, pp. 285-286, fig. 1).—The microprocedure consists in weighing in a microspoon a sample of butter of approximately 0.2 mg. picked with a dissecting needle under the microscope, ashing the weighed sample, and titrating with standardized silver nitrate solution. All the necessary apparatus is described in detail. It is stated that "the value of the method lies in the study of the salt distribution in butter, and it is particularly useful in the study of the effect of salt distribution on bacterial action."

A practical moisture test for American Cheddar cheese, I. A. GOULD (*Michigan Sta. Quart. Bul.*, 24 (1942), No. 4, pp. 318-321).—This is a description of the oil-salt method previously reported (E. S. R., 80, p. 152). Seventeen samples of American Cheddar cheese when analyzed for moisture content by this method and the 100° C. oven method were found to contain an average of 34.76 and 34.86 percent moisture, respectively.

Adaptation of the Scudi colorimetric method for pyridoxine, O. D. BIRD, J. M. VANDENBELT, and A. D. EMMETT (*Jour. Biol. Chem.*, 142 (1942), No. 1, pp. 317-322).—The Scudi method (E. S. R., 87, p. 11) for determining pyridoxin was modified to admit of routine determinations on pharmaceuticals and biological materials. Graded amounts of the unknown, estimated to contain from 5 γ to 100 γ of pyridoxin, were weighed out into calibrated test tubes, treated with 2 cc. of citrate-phosphate buffer (pH 3.0), diluted to 5 cc., and freed of interfering substances by adsorption of the pyridoxin on superfiltrol. Adsorption was most complete at pH 3.0, and 1 mg. of adsorbent to each microgram of estimated pyridoxin permitted complete adsorption and likewise complete elution. The tubes, with added adsorbent, were allowed to stand 30 min., with frequent shaking. After centrifuging the liquid was decanted, and the adsorbate, washed with the buffer solution, was treated with 10 cc. of a butanol solution containing 62.5 γ of 2,6-dichloroquinonechloroimide per cubic centimeter. Following this, veronal buffer was added which brought the pH to 7.8-8.0 and allowed the characteristic blue color to develop. Thus, elution and color development occurred simultaneously. The resulting butanol-water emulsion was separated by centrifuging, the butanol layer was decanted into the colorimeter tube, and the amount of color was determined in an electric photometer with a filter transmitting at approximately 650 m μ . The color in all the tubes of the unknown and of the standard was allowed to develop for the same length of time before making the color readings. The pyridoxin content of each unknown tube was determined in terms of the standard by reference to the curve drawn from photometer readings obtained for tubes containing known amounts of pyridoxin. The presence of 50 γ or 500 γ of thiamin, riboflavin, nicotine acid, sodium pantothenate, or 10 times these amounts of ascorbic acid did not influence the accuracy of the assay. Ascorbic acid, however, had to be first eliminated by the adsorption and elution technic, since it destroyed the blue color produced in the test. In practice the method proved to be rapid and simple.

Vitamin methods.—I, An improved procedure for estimating vitamin B₁ in foodstuffs and biological materials by the thiochrome test, including comparisons with biological assays, L. J. HARRIS and Y. L. WANG (*Biochem. Jour.*, 35 (1941), No. 8-9, p. 1050-1067, figs. 2).—The procedure, presented in detail, was based upon the method described for urine by Wang and Harris (E. S. R., 83, p. 851). For application to foodstuffs, two additional steps were required, the one being a preliminary extraction with acidified water (the procedure varying somewhat according to the nature of the product) and the other, digestion with papain and takadiastase to convert cocarboxylase into thiamin, to break down proteins, polysaccharides, etc., and to remove inhibitors. Other features

included washing of the digest with isobutanol to remove interfering substances; omission of adsorption because of variable losses; conversion into thiochrome in the presence of methanol, and with the addition of the $K_4Fe(CN)_6$ before the NaOH in order to protect against loss by oxidation; washing of the thiochrome layer with water to permit accurate differentiation between cocarboxylase and free thiamin, and to eliminate nonspecific fluorescent substances and pigments; and visual comparison of fluorescence with the aid of light filters and blank controls.

Results obtained by the method were in good agreement with those obtained by biological assay, chiefly by the bradycardia method, in tests with over 50 foodstuffs varying in thiamin content from 0.03 to 200 International Units per gram and including wheat meals and flours, other cereals, breads and biscuits, yeast preparations, meat and animal tissues, dairy products, and a few vegetables, fruits, and fish. In 75 percent of the cases the biological and chemical values differed by less than 15 percent and in 87 percent of the cases by less than 30 percent; the larger percentage errors were found only with the foods poor in thiamin or in dried products difficult to extract. Results could be duplicated with an error of about ± 5 percent when the method was applied to solutions containing 0.1 $\mu g.$ of thiamin per cubic centimeter and with an error of ± 10 percent with 0.03 $\mu g.$ per cubic centimeter. The method was found to be rapid and easy to apply.

Vitamin methods.—II, A note on vitamin B₁₂ in urine as determined chemically and biologically, L. J. HARRIS and Y. L. WANG (*Biochem. Jour.*, 35 (1941), No. 8-9, pp. 1068-1070, fig. 1).—Further tests with the improved thiochrome method of Wang and Harris (*E. S. R.*, 83, p. 851) applied to two urines, one high and one low in thiamin, showed that the results obtained agreed well with those obtained by biological tests (bradycardia method); for one urine the biological value was 110 percent of the chemical and for the other 101 percent. Recovery tests confirmed the reliability of the method.

Potentiometric determination of vitamin C, J. B. RAMSEY and E. L. COLLOHMAN. (Univ. Calif.). (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 4, pp. 319-321).—The potentiometric method described for the determination of ascorbic acid in pure solution or in citrus juices is carried out in an inert atmosphere (N_2). It depends upon a stable potassium iodate solution as the only standard oxidant, and at the same time makes use of the specific oxidation of ascorbic acid by 2,6-dichlorophenolindophenol. Standardization of the unstable dye solution is thereby eliminated.

Extraction of carotene from plant material: A rapid quantitative method, L. A. MOORE and R. ELY. (Mich. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 9, pp. 600-601, fig. 1).—A rapid quantitative method for the extraction of carotene from such plant materials as fresh green grasses and legumes, hays variously cured, and silages, involving the use of a commercial mechanical mixer in conjunction with a foaming solvent, was developed. A suitable mixture of 95 percent ethyl alcohol and petroleum ether produced a foam which prevented the splashing and jumping of the solvent. This method reduced the time required to extract carotene from plant material. The carotene values obtained agreed closely with those obtained from the usual alcohol extraction method.

Preserving and germicidal action of various sugars and organic acids on yeasts and bacteria, F. J. ERICKSON and F. W. FABIAN. (Mich. Expt. Sta.). (*Food Res.*, 7 (1942), No. 1, pp. 68-79).—The order of preserving and germicidal action of the sugars toward the bacteria studied was fructose > dextrose > sucrose > lactose. The thermophiles were more susceptible to sugar than were *Streptococcus lactis* and *S. liquefaciens*. The yeasts were more resistant than

bacteria to all the sugars studied. The preserving concentrations of fructose and dextrose were the same for yeasts, while for sucrose a 5-15 percent greater concentration was required. Lactose had no preserving action as against the yeasts. Fructose and dextrose were the only sugars having a germicidal action on all the yeasts. Sucrose killed only one yeast, *Saccharomyces cerevisiae*.

In terms of the number of grams of each acid in 10 cc. of broth, the preserving value of the acids for the bacteria was lactic > acetic > citric. Based on pH, the order was acetic > citric > lactic. The streptococci were considerably more resistant to acids than were the thermophiles. The yeasts were more tolerant to the acids than the bacteria. An acid strength of from 0.5 to 5 N was required to bring about a preserving and germicidal action against the yeasts, while the bacteria required a normality of from 0.1 to 0.3. The order of effectiveness of the acids in the preserving and germicidal range was acetic > lactic > citric for the yeasts, irrespective of whether it was based on pH or the percent of acid added.

For bacteria the order of effectiveness of the acids in combination with sugars was lactic > acetic > citric. Fructose and dextrose were more effective than either sucrose or lactose in combination with the acids. The thermophiles were not able to withstand a combination of fructose or dextrose with any of the acids, less than 2.5 percent of the sugars exerting a germicidal action. *Streptococcus lactis* and *S. liquefaciens* still retained their greater resistance. As against the yeasts, dextrose and fructose in combination with the preserving quantity of the respective acids were germicidal at a lower percentage than either sucrose or lactose in combination with the same amount of acid. In general, it took less dextrose and fructose to bring about a germicidal action with acetic than with lactic and less with lactic than with citric acid. Sucrose in combination with the preserving quantity of citric acid exerted a germicidal action on only two of the yeasts—*Saccharomyces cerevisiae* and *S. ellipsoideus*. No germicidal action was exerted by lactose in combination with any of the preserving quantities of the acids. In an acid and sugar combination the acid is the more important factor of the two in producing a germicidal effect on micro-organisms.

Freezer burning prevented by water, E. W. HENDERSON (*Michigan Sta. Quart. Bul.*, 24 (1942), No. 4, pp. 304-307).—To compare losses by dehydration, two 100-piece lots of roaster sized chicken were wrapped in 10 packages, each consisting of 10 pieces, with ordinary waxed butcher's paper and string. Both lots were frozen for 48 hr. at -25° F. Both lots were removed for the time required to glaze one lot by immersion in water. Both lots were returned to the original storage for 2.5 mo. At the end of the storage period all pieces in both lots except the giblets appeared fresh, normal, and free from "freezer burn." The glazed lot gained 0.4 percent in weight and the unglazed lot lost approximately 3 percent. The giblets in both lots lost from 10 to 23 percent in weight. Giblets should be either frozen together in a block of ice or placed in the bottom of a waxed paper package and glazed by immersing in water when fresh and freezing at once.

A search for new uses for low-grade tobacco (*Kentucky Sta. Rpt. 1941, pp. 12-13*).—Various constituents were examined to find possible commercial uses.

AGRICULTURAL METEOROLOGY

Climate and accelerated erosion in the arid and semi-arid Southwest with special reference to the Polacca Wash Drainage Basin, Arizona, C. W. THOMTHWAITE, C. F. S. SHAMPE, and E. F. DOSCH (*U. S. Dept. Agr., Tech. Bul.* 1396 (1942), pp. [2]-134, figs. 57).—Accelerated stream trenching or arroyo cut-

ting in the Southwest has been noted for over 50 yr. Ranges once carrying 10,000 head of cattle can now scarcely support one-quarter as many. Valleys converted by the first white settlers into prosperous farms are now deeply cut badlands unsuitable even for grazing. Apropos of this disturbing situation, the monograph here presented considers in detail studies of the climates of the Southwest, erosion in the Polacca Wash, and accelerated erosion in the Southwest.

Because of the more critical meteorological and vegetational balance, climatic variations produce far greater differences in plant growth and erosion in dry than in humid regions, and variations in precipitation and temperature from year to year may result in marked shifts of the climatic pattern. However, examination of evidence in tree rings, lake levels, cutting and filling of valleys, and in the development of pueblo peoples failed to reveal proof of any significant climatic change in the Southwest in the last 2,000 yr. Under natural conditions in the Polacca Wash and in most of the Southwest, the plant cover protected the soil and retarded the flow of water off the lands, but with acceleration of erosion, short discontinuous gullies became more numerous. As this continued, more of the gullies lengthened until they joined other gullies farther along the wash. This gully cutting has been the most obvious and destructive of the erosion forces at work in the Polacca drainage, but sheet erosion and wind erosion are also reducing the value of the lands, though the latter agency may be beneficial locally by helping to check erosion from running water.

There was no evidence of any appreciable uplift or tilting of the land or any change of the base level that might explain the recent acceleration of erosion in the Southwest, but owing to the delicate adjustment of vegetation to climate a succession of even a few dry years may so impoverish the plant cover that rains of even moderate intensity can initiate a period of increased erosion. The margin of safety in semiarid lands is slight and hence the amount of vegetation that can be safely grazed is small. In most of the Southwest the permissible amount has long since been exceeded. The Polacca drainage is now suffering the results of a grazing economy introduced to the Indians about 1540, though the human and animal population was not heavily concentrated until after the Civil War. It appears to have taken 15-20 yr. for the increased grazing to reduce the vegetal cover far enough so that changes in erosion became recognizable to the inhabitants.

If the removal of vegetation can be curbed and revegetation begun, it may still be possible to check the accelerated cutting so that the damage can be stopped. Changes in methods of herding are seriously needed. A shift from the corraling system to one of rotational pasturage in fenced enclosures would aid greatly in reducing the damage from trampling and would make it possible to allow time for the worst ranges to recuperate. Modernized mechanical aids such as diversion dams, distribution ditches, and spreader structures can be used to keep water out of the gullies and spread it over the valley lands. The accelerated erosion that is damaging the lands of the Southwest appears to have been caused by man, and by proper methods man can check it and reclaim the land for his use.

It is further suggested that the detailed study here presented can be of immediate use in at least two ways: (1) With the cutting off of our major sources of rubber, guayule has come to the fore as a possible substitute. It is native to semiarid areas, and the information here given should prove of assistance to those charged with finding the most suitable sites for producing this vital war material. (2) Analysis of the dry climates of the United States may find a more far-reaching value in the insight it gives to comparable climates in Australia and other theaters of the present war. Through a full understanding of the vari-

ability of these climates, troops of the United Nations can be properly equipped and trained to cope with the weather conditions they will encounter. There are 113 references.

The climates of California according to the Köppen classification, J. E. KESSELI. (Univ. Calif.). (*Geog. Rev.*, 32 (1942), No. 3, pp. 476-480, figs. 4).—As a supplement to the map of distribution of climates in North America recently presented by Ackerman (*E. S. R.*, 85, p. 12), the author here presents and discusses several more detailed maps of the temperature and climatic regions of California. There are 13 references.

Hail as a factor in the regional climatology of the United States, H. LEMONS. (Okla. A. and M. Col.). (*Geog. Rev.*, 32 (1942), No. 3, pp. 471-475, figs. 17).—Formidable among the many climatic evils besetting agriculture is the common hailstorm. No part of the United States is secure, but in certain regions, notably the Great Plains and the central lowland, hail is of such frequency and destructiveness as to constitute a major agricultural hazard to be ranked on a par with drought. The time-areal distribution of hail and the factors influencing it are discussed, and the annual, seasonal, and monthly distribution, based on U. S. Weather Bureau data over a 40-yr. period (1899-1938), is shown on maps. The seriousness of the damage in the two areas above noted lies not only in the frequency of hailstorms but in the fact that the chief crop plants are of types particularly susceptible to such injury and that the period of maximum hail often coincides with the main growth periods of these crops. In other parts of the country hailstorms are only a minor risk, but the unpredictableness of their visitations makes them a phenomenon constantly to be feared by growers of such crops as tobacco, cotton, fruit, and vegetables.

The average growing season and departures therefrom in lower Michigan, V. R. GARDNER (*Michigan Sta. Quart. Bul.*, 24 (1942), No. 4, pp. 312-318, figs. 3).—Following brief comments on the criteria usually employed in classifying seasons as early or late, the following are graphically presented and discussed, viz, the mean minimum, mean average, and mean maximum temperatures recorded at East Lansing for 1921-26 and averages for the 50-yr. period 1890-1939; the monthly mean temperatures for the coldest (1907) and the warmest (1921) years for a 50-yr. period and the average mean monthly temperatures for 1890-1939; the average monthly maximum, mean, and minimum temperatures for the 30-yr. period 1910-39; the average monthly mean temperatures at four stations in the State for this 30-yr. period; and the response of vegetation to differences in temperature, including the range in dates of certain phenological "events" that may be used to measure the relative earliness or lateness of a season and comparisons of the dates for certain of these events in southern and northern points in the "fruit belt" of the State.

Methods of computing a regression of yield on weather, E. E. HOUSEMAN (*Iowa Sta. Res. Bul.* 302 (1942), pp. 861-904, figs. 3).—The method developed by R. A. Fisher for examining the influence of rainfall on the yield of wheat at Rothamsted has formed the basis for a number of investigations, which are briefly noted. Application of Fisher's device gives a regression curve which shows the effect on yield of a unit change in a given meteorological element at any time during the growing season. In this paper the interest is mainly in presenting expeditious methods of handling the data, when applying Fisher's method, in a manner which is understandable by those with only a small knowledge of statistics, and also in including enough computational detail in the illustrations so that they can be used as a guide by the computer. The method is illustrated for two cases, viz, for the regression of yield on one weather factor, and for that on two weather factors simultaneously. For illustration, data on the yield

of Hogue Yellow Dent in corn varietal tests at Lincoln, Nebr., together with rainfall records during the period May 1–August 28, 1906–33, were chosen. Details for the method in the two cases above noted are given and discussed. Tables present the precipitation, yield, and statistical data, and two appendixes discuss, respectively, the derivation of the regression function and an alternative method of calculating the distribution coefficients. There are 10 references.

The incidence of drought in Queensland during the 50-year period, 1886–1935, W. R. BALDWIN-WISEMAN (*Jour. Inst. Civil Engin.* [London], No. 6 (1941–42), pp. 225–226).—This is an abridged report of a study from which it is concluded that close systematic analyses of long-term meteorological records along the lines indicated will afford valuable data for investigating water resources and for a drought index of pasture and crop lands in arid or semiarid areas for use in insurance against drought, in acquisition or lease of lands, and in matters relating to relief or to classification, rehabilitation, or abandonment of marginal lands.

Two cold January nights against a background of thirty winters (a report on fruit bud killing), N. L. PARTRIDGE (*Michigan Sta. Quart. Bul.*, 24 (1942), No. 4, pp. 337–342, figs. 4).—Experience has shown that at irregular intervals destructive winter frosts and freezes are to be expected throughout the lower Michigan peninsula, and that they are much more likely to occur in some parts of the State than in others is evident from the records of 30 winters here mapped to show the frequency with which temperatures of -12° F. or lower have occurred. Most of the minimum temperatures observed by the 74 cooperators of the U. S. Weather Bureau in the region for the month were recorded on the nights of January 7–8 and 9–10, 1942. Details of accompanying conditions are given and the effects on fruit trees, with special reference to peach, are described. Such injury as fruit bud killing is said to be most likely to follow influences delaying the maturity of the tree, and such conditions had prevailed the preceding fall. The safest areas for growing peaches in Michigan are mapped.

What has happened to fruit trees since the midwest blizzard of November 1940, T. J. MANEY. (Iowa Expt. Sta.). (*Amer. Pomol. Soc. Proc.*, 57 (1941), pp. 182–189, figs. 2).—This is a summary of the meteorological conditions during this blizzard in Iowa and of the injuries to horticultural plants, including apple and stone fruit trees, small fruits, and tree and other perennial ornamentals. Histological injuries are also discussed and illustrated.

Orchard cold damage resulting from freeze of November 11–15, 1940, T. J. TALBERT. (Univ. Mo.). (*Amer. Pomol. Soc. Proc.*, 57 (1941), pp. 177–182).—This is a summary of the damage to pome and stone fruit trees of Missouri by this severe freeze, and a review of the literature on cold as a factor in killing tree tissues including crotch and crown injury and contributing factors.

Frost injury to apples, J. M. S. PORTER (*Agriculture, Jour. Min. Agr.* [Gt. Brit.], 49 (1942), No. 1, pp. 60–61).—Due to the unusual condition that in the spring of 1941 frosts of varying degrees occurred during the flowering period, it became possible to make a tentative classification of 43 apple varieties into 3 groups according to their susceptibility to frost. It is presented here, with discussion.

Monthly Weather Review, [March–April 1942] (*Mo. Weather Rev.* [U. S.], 70 (1942), Nos. 3, pp. 43–64, pls. 11, figs. 2; 4, pp. 65–92, pls. 10, figs. 15).—In addition to meteorological, climatological, solar radiation, and sunspot data, these numbers contain the following contributions: No. 3, Summary of the Intensity and Spectral Distribution of Solar Radiation at New Orleans 1831–40, Inclusive,

by H. S. Mayerson, J. S. Graham, and H. Laurens (pp. 43-48); and No. 4, The Development and Trajectories of Tornadoes, by J. R. Lloyd (pp. 65-75).

[Meteorological services and observations by the Florida Station] (*Florida Sta. Rpt. 1941*, pp. 135-137, 157-159, 178, 179, fig. 1).—The functions of the Federal-State Horticultural Protection Service are outlined and the forecasting and temperature survey work by the station is discussed, with a tabulation of verifications of 15,106 temperature forecasts during the winter of 1940-41; the meteorological research by the station is summarized; and records are presented of temperatures, precipitation and evaporation, wind velocity, and barometric pressure for the Everglades Substation and of precipitation and temperatures for the North Florida Substation.

Meteorological report for 1940, F. E. HEPNER (*Wyoming Sta. Rpt. 1941*, pp. 43-45).—Following a brief summary statement for this station, tabulations by months are presented for air pressure, temperature, precipitation, and wind.

Hourly precipitation on the Upper Ohio and Susquehanna Drainage Basins, [January-December 1938] (*U. S. Dept. Agr., Soil Conserv. Serv., 1939, SCS-PC-1-5; 1940, SCS-PC-6-7; 1941, SCS-PC-8-12*, [about 500 pp., 500 figs. each]).—The hourly precipitation is indicated on maps of the basin.

SOILS—FERTILIZERS

The relationship of soil science to land-use planning, R. V. ALLISON. (Univ. Fla.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 17-23).—The current status of this relationship within the Soil Science Society, in our agricultural institutions, and on the land itself is discussed.

[Soil investigations by the Arizona Station]. (Partly coop. U. S. D. A.). (*Arizona Sta. Rpt. 1941*, pp. 8-15).—Progress of research is noted on lysimeter experiments with soil-improving rotations which made Mohave, an upland soil, equal in productivity to Gila, a river bottom soil; the establishment of revegetation on overgrazed and badly eroded areas; the influence of organic matter decomposition on the chemical and physical properties of Arizona soils; rate of nitrification of nitrogenous fertilizers in soils from the Salt River Valley; nodulation of soybeans in Arizona soils; soil reaction as related to plant nutrition; Yuma mesa lands; acidulated fertilizers; soil moisture investigations; and determination of available phosphate in alkaline-calcareous soils.

[Soil investigations by the New Haven Station] (*Connecticut [New Haven] Sta. Bul. 452* (1942), pp. 23, 24).—Organic matter and nitrogen maintenance under intensive cropping conditions, the effects on Connecticut soils of cultivation and erosion, and soil maintenance for vegetables are reported upon by M. F. Morgan et al.

[Soil investigations by the Florida Station]. (Partly coop. U. S. D. A.). (*Florida Sta. Rpt. 1941*, pp. 97-100, 122, 126, 127, 130, 131, 133, 134, 142-143, 160-161, 162-165, 188, fig. 1).—The following are noted by J. R. Beckenbach, D. G. A. Kelbert, J. R. Henderson, F. B. Smith, R. E. Blaser, G. M. Volk, C. E. Bell, G. T. Sims, K. P. Bragdon, M. Peech, V. C. Jamison, J. R. Neller, F. S. Andrews, W. T. Forsee, Jr., F. T. Boyd, B. S. Clayton, and J. D. Warner: Studies on rapid soil tests in relation to response of truck crops and fertilizer recommendations; selection of a suitable rapid soil testing method for use in making fertilizer recommendations; secondary element requirements and deficiency symptoms of vegetable crops; comparative efficiency and economy of different nitrogenous fertilizer materials on sandy soils; soil and water conservation; soil and vegetation surveys in relation to pasture development in Florida; the types and distribution of micro-organisms in Florida soils; metabolism and functional relationships of soil micro-organisms under Florida

conditions; interrelationships of microbiological action in soils and cropping systems in Florida; the availability of calcium and phosphorus of colloidal phosphate applied to soils adapted to pasture; adjustment of reaction of Florida soils; factors determining the toxic limits of calcium cyanamide; nitrogen supply and deficiencies of trace elements; soil correlations; soil fertility investigations under field and greenhouse conditions; water control investigations; crop rotation studies; studies upon the role of special elements in plant development upon the peat and muck soils of the Everglades; and sweetpotato fertilizer and storage experiments.

[Soil investigations by the Kentucky Station] (*Kentucky Sta. Rpt. 1941*, pp. 6-9, 47).—These include work on the effect of cropping and manure treatments on amount of nitrogen in soil, phosphorus compounds in Kentucky soils, manure as a source of potash, effect of excessive liming on yield and quality of crops, pastures—effect of different fertilizer treatments on phosphorus and calcium content of herbage, tests for need of the minor elements in soils, and control of soil erosion on steep land.

[Soil investigations by the Massachusetts Station] (*Massachusetts Sta. Bul. 388 (1942)*, pp. 10-11, 12, 19, 31-34, 53, pl. 1).—Soil conservation research projects on wind-blown soils and topsoil removal and experimentation with historical "soil-test plats" are reported upon by K. J. Kucinski and W. S. Eisenmenger; nature of soil erosion in Massachusetts, by A. B. Beaumont and Kucinski; lowering of pH by soil nitrates, by R. W. Donaldson, Eisenmenger, and H. M. Yeglan; the effect of arsenious, arsenic, and antimony oxides on soil and plant growth, by Eisenmenger and Yeglan; nitrification in soils containing plant residues of high lignin content, by J. E. Fuller; the influence of base exchange capacity and of exchangeable ions in Massachusetts soils on the availability of potassium, the relationship of base exchange capacity, exchangeable hydrogen, and soil reaction to the lime requirement of Massachusetts soils, and the fixation of arsenic in soils and the influence of arsenic compounds on the liberation of fixed phosphates, all by D. H. Sieling; and the effect of orchard mulches on the plant nutrient elements in the soil, by Sieling and J. K. Shaw.

[Soil investigations by the New Jersey Stations] (*New Jersey Sta. Rpt. 1941*, pp. 77-78).—Line 14 of the abstract previously presented under this title (E. S. R., 87, p. 342) should read as follows: The soil conservation program is not too complicated for use on the average New Jersey farm.

Soils of Golden Valley County: Soil reconnaissance of Montana—Preliminary report, L. F. GIESEKER. (Coop. U. S. D. A.). (*Montana Sta. Bul. 403 (1942)*, pp. 51, fig. 1, maps 4).—This survey, similar in scope and method to those previously noted (E. S. R., 82, p. 306), deals with an area contained in the Musselshell River Drainage Basin between the Big Snowy Mountains and the Musselshell-Yellowstone River Divide. It covers 1,216 sq. miles.

A petrographic method for the study of soil formation processes, C. E. MARSHALL. (Mo. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 100-103).—The author points out and illustrates the great "aid which petrological methods can render, first in deciding questions of origin and second in enabling us to form a clearer picture of soil-forming processes." Neither chemical nor mechanical analysis has proved sufficient to decide the most difficult cases.

The development of loessial soils in central United States as it reflects differences in climate, H. B. VANDERFORD and W. A. ALBRECHT (*Missouri Sta. Res. Bul. 345 (1942)*, pp. 31, figs. 5).—The loessial soils along river bluffs of the central United States were studied, all factors of soil development, except climate, being as nearly constant as is possible under natural conditions. Quantitative measurements of the size distribution of particles in the profiles, the nature of the clay, the exchangeable bases, the organic content of the

surface layers, and the mineralogical make-up of the silt fraction were used as indices of developmental differences in the soil profiles. Many aspects of soil properties under different climatic conditions in their relation to soil development are brought together.

The clay content increased with the rainfall and temperature, and the nature of the clay also changed. The exchangeable bases in the soil decreased as the climatic conditions became more humid and warmer. The organic matter and nitrogen contents of the surface layers decreased as the temperature increased. Study of the silt fraction indicated that the parent material was constant for all locations and that the solum had undergone changes corresponding with the intensity of the climatic conditions.

Soluble material of soils in relation to their classification and general fertility. M. S. ANDERSON, M. G. KEYES, and G. W. CROMER (*U. S. Dept. Agr., Tech. Bul. 813 (1942), pp. 79, figs. 12*).—The studies here reported include comparisons of soil solutions variously prepared from representative series of some of the important great soil groups and of base-exchange relationships of these same soils. Data upon the relation between soil solutions and plant response to alteration of the water-soluble components, after alteration of important soil types has taken place through cultural practice, are also presented. Following an outline of the plan of work, the bulletin gives a description of the virgin soils studied and takes up factors affecting solubility of virgin soils, electrical-conductivity measurements, chemical composition of soil solutions variously prepared from virgin soils, soluble material in relation to depth in a soil profile, interrelationships of constituents, soluble material in cultivated soils in relation to crop growth, relation between total chemical composition of soil and the water solution, and soil solution as a medium for plant growth. Soils of the Podzol, Chernozem, Prairie, Gray-Brown Podzolic, lateritic, and Red Podzolic groups were investigated and are reported upon in detail both qualitatively and in terms of tabulated numerical data.

Effect of drought and rainfall on movement of soil nitrogen in Cecil soils. E. D. MATTHEWS (*Georgia Sta. Cir. 137 (1942), pp. 7*).—Experiments here briefly described indicated the following:

- Prolonged dry weather, which completely dries the upper few inches of soil, causes most of the soil nitrates to come to or near the soil surface. Nitrates in the surface soil during dry weather are not available to crops and may be lost by sudden hard rains causing runoff, or by blowing, particularly if stock is allowed to trample or root. Neither ordinary showers nor heavy rains cause any appreciable leaching of nitrate on Cecil sandy loam soils. Continued showers remove more nitrate from the surface to lower depths than other types of rain, but even they may not cause much nitrate to be lost unless rains continue for long periods. In dry weather nearly all of the nitrate and ammonia nitrogen is in the top foot of soil, regardless of what source of nitrogen is used. When rainfall is sufficient to cause much downward movement of soil nitrogen, nitrate nitrogen is more readily leached than ammonia nitrogen. However, the leaching of nitrate nitrogen bears no relationship to the nitrogen fertilizer used. The leaching of ammonia nitrogen is small, and the more ammonia nitrogen furnished by the fertilizer the less leaching of both ammonia nitrogen and nitrate plus ammonia nitrogen.

The determination of pH at soil moisture contents approximating field conditions. H. D. CHAPMAN, J. H. AXLEY, and D. S. CURTIS. (*Calif. Citrus Expt. Sta.*). (*Soil Sci. Soc. Amer. Proc., 5 (1940), pp. 191-200*).—With the Beckman type glass electrode equipment, pH readings on soils at moisture contents as low as that of the air-dry state can be obtained. However, with

air-dry soils the readings rapidly drift and bear little resemblance to those obtained when the moisture is somewhat higher. At moisture contents corresponding to the moisture equivalent, stable readings may be obtained provided the electrodes are worked around or in and out of the soil prior to taking the reading. Imperfect coverage of the glass electrode with the soil moisture film will give erratic, unreliable values. Reasonably stable and reproducible pH readings can be obtained with soils at the sticky point or beyond. Tests on some 50 widely different soils at moisture contents corresponding to and on either side of the sticky point gave results of such constancy and consistency as to suggest the suitability of such a method for pH determinations on soils generally. Considerable differences in moisture content in this general range had but little effect on the pH value. In all the soils studied, pH values on 1:2.5 water suspensions were significantly higher than those on soils at moisture contents characteristic of possible field conditions. The p_{II} values obtained immediately after wetting the soil to the sticky point or higher were not significantly different from those obtained after the soils had stood in the moist state at room temperature for several hours or days. Average values for in situ readings were little different from those obtained when the soil was removed to a beaker. There was considerable variation between readings made at different points in an area, however.

Redox potentials of desert soils under varying conditions of sterilization, aeration, and puddling. T. F. BUEHRER, W. P. MARTIN, and B. P. CARDON. (Univ. Ariz.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), p. 241).—This investigation was part of a general study of the effect of puddling on soil fertility.

Measurement of redox potentials under N₂ or storing soil samples under nitrogen before measurement of the redox potential, invariably leads to erroneous results. Furthermore, there exists a "suspensions-effect" in redox measurements similar to that observed in pH determinations, making it necessary that the soil be kept continuously in suspension during the course of measurement. Vigorous mechanical stirring in air was found to be most conducive to reproducibility in the redox potential measurements.

The relation of soil temperature to soil moisture: Pressure potential, retention, and infiltration rate. R. E. MOORE. (Univ. Calif.) (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 61-64, figs. 4).—The pressure potentials and water retention after suction were determined both in soils which had been moist for a long time and in soils saturated for 24 hr. only. The maxima and minima in the curves suggest that temperature as such may be of minor importance in determining the pressure potential or water retentions resulting from these experimental conditions, but that other factors are involved, the effects of which may be influenced by the course and magnitude of temperature change and the duration of a given temperature range. In experiments on water retention after irrigation and on infiltration rate air-dry soils were used, and the major water percolation and distribution took place before the soil was completely slaked. Under these conditions the opportunity for factors other than temperature and viscosity to develop effects was minimized. The gross trends of the curves indicate effects due to viscosity, but maxima in portions of the curves suggest that factors other than viscosity affected the properties of soil moisture retention and percolation.

Soil moisture and plant growth in relation to pF. C. M. WOODRUFF. (Mo. Expt. Sta.) (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 36-41, figs. 8).—A number of tentative conclusions as to the state, retention, and movement of moisture in soils are set forth. Among the experimental results noted is the observation that a pF value near 3.0 is of fundamental importance in that it represents the

maximum quantity of water that a soil will hold against the force of gravity or as a result of capillary movement to regions of lower moisture content resulting from evaporation or plant use. pF 3 defines the smallest size of pore that will function as a capillary for the free movement of water. The moisture held above pF 4.1 to 4.2 is not available to plants. In most instances the principal supply of water for plants is held between pF 3.0 and 4.1. The volume of the soil pore space required to accommodate moisture held above pF 3 may be so great as to exclude the minimum amount of air required for plant root development. The adsorbed moisture in a soil surrounds each particle preventing contact with other particles. Loss of adsorbed water causes shrinkage which increases the capillarity of the soil until it becomes rehydrated. The capacity of the soil as a reservoir for absorbing rain and as a reservoir for supplying water for plant growth is governed by both the adsorptive capacity below pF 4.1 and the depth to which plant roots penetrate.

Concerning permeability units for soils, L. A. RICHARDS. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 49-53, figs. 2).—A permeability unit acceptable for general use in different lines of work must be based on a flow equation which is adequate to cover a variety of flow cases. The equation

$$v = \frac{k}{\eta} (\rho F - \nabla p) \equiv \frac{k}{\eta} \rho g i$$
 seems to have certain advantages. In this equation i is the hydraulic gradient, v is the volume of water crossing unit area in the soil in unit time, and k is the Darcy coefficient of permeability. The quantity ρ is the density, F the body force per unit mass, p the pressure, η the viscosity, and ∇ the gradient operator. For soil moisture flow, F represents the gravity force and is numerically equal to the acceleration of gravity, g . "The k in this equation could be referred to as the cgs unit of permeability, or in view of the various meanings associated with permeability it might be desirable from analogy with the treatment of thermal and electrical flow in physics to designate this k as 'fluid conductivity.' There is precedence for such a name in the literature of both soil science and engineering."

Adsorbed ions on the colloidal complex and plant nutrition, W. A. ALBRECHT. (Mo. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 8-16, figs. 14).—The inadequacy of the soil solution as an explanation of the supply of nutrients to the plant from the soil is pointed out, and the part played by the clay colloids as a storage reservoir of nutrient ions and inactivator of toxic ions is discussed. An experiment in which clay colloid containing calcium as its only adsorbed nutrient ion gave much better growth than did potassium or magnesium clays is briefly described. The possibility of nutrient movement from plant root to soil colloid as well as from soil to plant is also taken up, together with the relation of calcium movement to degree of clay saturation with that element, movements of plant nutrients from plant to soil under conditions of calcium deficiency, etc.

Plant composition as an index of soil fertility, F. MOSER. (S. C. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 147-151).—The nutrient content as determined by plant analysis for certain critical elements absorbed by plants at maximum growth is suggested as an index of fertilizer requirements for lateritic soils. Pot experiments on Cecil sandy loam show that lespedeza and Austrian Winter peas make their optimum growth at pH ranges of from 6.0 to 6.5, while the deleterious effect of low pH values can best be offset with liberal phosphate application. For good quality hay and for best production, both limestone and superphosphate are recommended.

The effect of substituted cations in the soil complex on the decomposition of organic matter, F. B. SMITH and T. WHITEHEAD, Jr. (Fla. Expt. Sta.).

(*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 248-253, figs. 4).—The authors electrolyzed Tama silt loam (an Iowa soil) in a Mattson cell (E. S. R., 56, p. 115) and either resaturated with calcium, magnesium, or ammonium ions or mixed the calcium-saturated soil with various proportions of hydrogen-saturated soil. Bentonite clay was similarly treated. A barium bentonite was also prepared. The rates of decomposition of various forms of organic matter in the soil and in mixtures of the clay with sand were determined in terms of the carbon dioxide produced. Green sweetclover in Tama silt loam showed the least decomposition rate in the hydrogen-saturated soil, a much greater decomposition in the calcium-saturated soil, somewhat more in the original soil and in the ammonium-saturated soil than in the calcium-saturated, and decidedly more in the magnesium-saturated soil than in any of the preceding. Natal grass in barium, calcium, and magnesium bentonites mixed with sand showed the greatest decomposition in the presence of the calcium-saturated clay at all sand-clay proportions. At the proportion providing 4.92 milliequivalents of the base, or 8.20 m. e., more decomposition was shown in the barium than in the magnesium clay, but with 11.48 or 16.40 m. e. of the base present the decomposition was greater in the magnesium than in the barium clay mixtures. Effects of percentage of saturation with the base and numerous other related observations are also recorded.

Evidence of the limited importance of soil bacteria as a direct factor in the aggregation of Prairie soils, H. E. MYERS, T. M. MCCALLA, and H. E. JONES. (Kans. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), p. 254).—The data indicate that bacteria are associated with and responsible for the aggregation of soil particles only insofar as they are responsible for the accumulation of certain metabolic products that function as cementing materials. Changes in H-ion concentration as a result of the decomposition of added organic materials were not concomitant with changes in aggregation. Adjustment of the pH of soils within the approximate limits of from 4.1 to 6.7 did not significantly influence the stability of preformed aggregates. No tendency of calcium to improve the stability of aggregates was observed. The addition of water to pulverized air-dry soil caused a very sharp and rapid increase in the percentage of water-stable aggregates. This increase occurred in sterilized soils, hence is independent of microbial activity.

Influence of microbial activity upon aggregation and erodibility of lateritic soils, T. C. PEELE and O. W. BEALE. (U. S. D. A. coop. S. C. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 33-35).—The aggregation of Cecil sandy loam was greatly improved through the activity of certain species of fungi (especially *Penicillium oxalicum* and *Fusarium moniliforme*) and bacteria under aseptic conditions. The addition of sucrose plus inoculation with *P. oxalicum* to field plats on Cecil sandy loam caused an increase in aggregation and a decrease in runoff and erosion. The increased aggregation was attributed to microbial activity and the decreased runoff and erosion to the increased aggregation. In pots of this soil ground oat straw with the same inocula also increased aggregation.

Soil bacteria may solve shortage, J. E. CONN (*Farm Res. [New York State Sta.]*, 8 (1942), No. 3, p. 16).—A shortage of the indicator litmus has developed since the German invasion of the Netherlands where litmus was prepared from lichens which were imported from the Dutch Colonies. In attempting to overcome this shortage it was discovered at the station that a certain kind of soil bacteria produces a substance surprisingly like litmus. The pigment produced, however, is not entirely satisfactory, and further research is necessary.

A fixation method for determining the phosphorus and potassium requirements of soils, E. R. PUEVIS and J. M. BLUME. (Va. Truck Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 201-204).—Laboratory and field data are presented to show the relationship existing between the amount of phosphorus and potassium absorbed by a soil from a standard solution and the response of various crops to fertilization of the soil with these elements. An absorption method for determining the phosphorus and potassium requirements of soils is described.

Efficient use of manure patriotic duty as well as good business on Colorado land, R. GARDNER (*Colo. Farm Bul. [Colorado Sta.]*, 4 (1942), No. 3, pp. 8-10, fig. 1).—A discussion of the importance of utilizing manure as efficiently as possible during the emergency period because of the need of the war industries for some of the chemicals used in the manufacture of commercial fertilizers.

Fertilizers other than nitrogen for cotton in the Delta, R. KUYKENDALL (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 7, p. 2).—The development of fertilizer use and response under delta soil conditions in Mississippi is discussed. Based on tests from various areas, it has been found that there are conditions under which phosphorus and potash are needed for maximum crop production.

Soil and crop interrelations of various nitrogenous fertilizers: Windsor lysimeter series B, M. F. MORGAN and H. G. M. JACOBSON (*Connecticut [New Haven] Sta. Bul.* 458 (1942), pp. 269-328, figs. 2).—Fifteen nitrogen carriers were compared in outdoor lysimeter tanks filled with Merrimac sandy loam, with tobacco as the indicator crop. The soil was placed in the lysimeters in successive fillings of mixed and carefully packed soil so as to be representative of the soil profile under field conditions. Ten yr. of nitrogen treatment are reported and also 1 yr. of no treatment to show the residual effects. The nitrogen carriers investigated were sodium nitrate, potassium nitrate, calcium nitrate, ammonium sulfate, Ammo-Phos, urea, Calurea, cyanamide, cottonseed meal, castor pomace, linseed meal, fish meal, dried blood, tankage, and cow manure. The plants grown, as well as the leachate obtained, were analyzed to determine differences in amounts and rates of available nitrogen liberation in the soil. Data are given on the total nitrogen removed by the crop, unit composition of the crop, nitrogen represented in the drainage water in successive periods of leaching, the residual nitrogen after 10 yr. of treatment as measured by crop and leaching, and nitrogen content of the soil at the end of the experiment, in comparison with the initial amount. Detailed statements are also presented on the characteristics of the various fertilizer materials used.

Catalytic activity causing the hydrolysis of urea in soils as influenced by several agronomic factors, J. P. CONRAD. (Univ. Calif.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 238-241, figs. 4).—Each subsample of 400 gm., mixed with about 10 cc. of toluene, was placed in its respective percolator. Toluene in excess of saturation was added to each urea solution in preparation for percolation. The percolators were maintained at approximately 30° C. Enough solution, varying from about 100 to 160 cc., was added to wet the soil initially and bring it to the verge of dripping. Every 12 hr. thereafter until the end of the test 75 cc. of the same concentration of solution was added. The residual urea in successive percolates caught was determined. Two types of catalytic activity were in evidence, viz, a nearly constant activity and a rising activity. In some soils the rise was very rapid. Samples of deep mineral subsoils showed little activity, generally nearly constant, or no activity. Activities at higher levels in the profile were generally progressively greater. They were generally of a

nearly constant or slowly rising type. The activities of the surface soil samples were the highest of their respective profiles and were often of a rapidly rising type. Cropping and cultural practices which added organic matter to the soil usually resulted in high activities and frequent cases of a rapidly rising type, especially in the surface soil. Practices which tend to deplete organic matter resulted in a lower and a more nearly constant activity.

The response to magnesium of six different crops on sixteen Alabama soils, A. L. SOMMER, J. I. WEAR, and A. BAXTER. (Ala. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 205-212, figs. 2).—Of the crops grown, corn (vegetative stage only) responded least and crotalaria and peanuts (yield of nuts) most to magnesium sulfate in greenhouse tests. Cotton and crimson clover gave considerable response and turnips relatively little. Of the general soil types considered, the Norfolk sands and sandy loams were most deficient in magnesium. A decrease in the magnesium content of some of the soils was shown by the difference in response to magnesium fertilization of the two corn and of the two turnip crops, as well as by soil analyses at the beginning and end of the experiment. The magnesium content in Chilean sodium nitrate and in potassium chloride was sufficient to benefit only corn. Superphosphate furnished sufficient magnesium for the growth of all crops except crotalaria and peanuts grown in the most deficient soils. A correlation whereby crop response could be predicted from the magnesium content of the soil was not found.

✓An easier, more effective method of applying fertilizers, C. B. SAYRE (*Farm Res. [New York State Sta.]*, 8 (1942), No. 3, pp. 8-10 figs. 4).—Methods of applying fertilizer that will produce satisfactory crop yields and reduce the amount of labor required are of special importance during the emergency period when labor is one of the essential factors in meeting the food production goals. Fertilizer placement in relation to the crop being produced has been shown to have a considerable effect on the yield. In this article reporting a comparative study of recent methods of applying fertilizers, plowing under is reported by the author to have the following advantages: (1) Labor is saved since the fertilizer is applied while plowing; (2) fertilizer placed in an area accessible to the roots can be more effectively used by the crop to increase yields; (3) it avoids burning injury; (4) the rush of work at planting time is avoided by applying the fertilizer with plowing; and (5) plants are enabled to continue growth during drought periods with deep placement of fertilizer.

Commercial fertilizers in Kentucky in 1941, J. D. TURNER, H. R. ALLEN and L. GAULT (*Kentucky Sta. Regulat. Ser. Bul. 30* (1942), pp. 63).—In addition to the results of inspection and analyses of commercial fertilizers sold in Kentucky, this publication contains a timely discussion on low-grade fertilizers, as well as information on the use of fertilizers for maximum production during the emergency.

Registration, labeling, and inspection of commercial fertilizers, 1941, M. F. MILLER, L. D. HAIGH, E. W. COWAN, and V. B. WILLIAMS (*Missouri Sta. Bul. 449* (1942), pp. 52).—This bulletin consists of the usual annual report of analyses and compliance of commercial fertilizers with the State law.

AGRICULTURAL BOTANY

[Botanical studies by the Massachusetts Station] (*Massachusetts Sta. Bul. 388* (1942), pp. 28-29).—Brief progress reports are given by L. H. Jones, J. W. Hall, and B. Eames on the effect of soil temperature on growth of corn, tomato, and rose used as indicator plants; and the effect of root media on root structure of soybean and corn plants and of geranium and chrysanthemum cuttings.

Lehrbuch der Botanik für Hochschulen [Eduard Strasburger's college textbook of botany], edited by H. FITTING, H. SIERP, R. HARDER, and F. FIEBAS (Jena: Gustav Fischer, 1942, 21. ed., pp. XII+626, pl. 1, figs. 846).—Other editions of this book have been noted (E. S. R., 67, p. 20).

Den Danske Botaniske Litteratur, 1912-1939 [Danish botanical literature, 1912-1939], C. CHRISTENSEN (København (Copenhagen): Ejnar Munksgaard, 1940, pp. [6]+350, [figs. 78]).—The bibliographies are arranged by authors, and an author index is provided. Portraits of 78 botanists are included.

Some proposals for the war-time use of plankton, N. POLUNIN (*Chron. Bot.*, 7 (1942), No. 3, pp. 133-135).—This is a brief review of the literature on possible uses of plankton for human or animal food and for plant nutrition.

Ageing without reproduction and the viability of young bacterial cells at low temperatures, J. M. SHEERMAN and H. B. NAYLOR (Cornell Univ.) (*Jour. Bact.*, 43 (1942), No. 6, pp. 749-756).—*Escherichia coli* and *Streptococcus lactis* were studied at 1° C.

A new type of glucose fermentation by *Clostridium thermoaceticum* n. sp., F. E. FONTAINE, W. H. PETERSON, E. MCCOY, M. J. JOHNSON, and G. J. RITTER (Wis. Expt. Sta. coop. U. S. D. A.). (*Jour. Bact.*, 43 (1942), No. 6, pp. 701-715, fig. 1).—In the fermentation of glucose by *C. thermoaceticum* n. sp., 85 percent of the carbon in the glucose destroyed is recovered as acetic acid.

The lactic acid fermentation of streptococci, P. A. SMITH and J. M. SHEERMAN (Cornell Univ.). (*Jour. Bact.*, 43 (1942), No. 6, pp. 725-731).—The lactic acid production of the better known species of streptococci (pyogenic, viridans, lactic, and enterococcic groups) was studied by methods described and is discussed. The average percentage of lactic acid from glucose fermented for each species is given.

Mycological nomenclature, G. R. BISBY (*Phytopathology*, 32 (1942), No. 7, pp. 644-645).—Formal consideration is requested for two changes in the International Rules of Botanical Nomenclature with respect to fungi.

On the primary dispersal and isolation of fungal spores, C. G. DOBBS (*New Phytol.*, 41 (1942), No. 1, pp. 63-69, fig. 1).—A distinction is drawn between active and passive, primary and secondary, spore dispersal, and a tentative grouping of passive primary dispersal types is outlined, in the order of increasing importance of air and decreasing importance of water. A majority of fungi tested in air were found to be spore shedders, a minority spore retainers. It is pointed out that previously all methods of spore isolation have made use of water as the primary dispersal medium, and a simple method of isolation by air is described.

The role of isolation in the differentiation of plant species, G. L. STEBBINS, JR. (In *Biological Symposia*, VI, edited by J. CATTELL. Lancaster, Pa.; Jacques Cattell Press, 1942, vol. 6, pp. 217-233).

Determination of correct scientific names of common plants (Arizona Sta. Rpt. 1941, pp. 48-49).—Brief notes are given on the nomenclature of the screwbean, California poppy, and cockroach plant.

Anatomical and taxonomic approaches to subgeneric segregation in American *Quercus*, A. H. TILSON and C. H. MULLER (U. S. D. A.) (*Amer. Jour. Bot.*, 29 (1942), No. 7, pp. 523-529, figs. 9).—A study of the wood anatomy of 104 species of American oaks in comparison with the conventional taxonomic characters led to the conclusion that the former does not constitute a basis for subgeneric division and only roughly indicates a possible division of the white oak subgenus into sections. There are 18 references.

The red oak complex in the United States, E. J. PALMER (*Amer. Midland Nat.*, 27 (1942), No. 3, pp. 732-740, figs. 2).—A taxonomic study of this group of

the genus *Quercus*, with a key to the five species and several varieties. There are 14 references.

Quercus macrocarpa in Alabama, R. M. HARPER (*Jour. Elisha Mitchell Sci. Soc.*, 58 (1942), No. 1, pp. 60-64, pl. 1, fig. 1).—Notes on the distribution and seedling stages and variability of this oak.

The relationship of *Ranunculus* to the North American floras, L. BENSON. (Ariz. Expt. Sta.). (*Amer. Jour. Bot.*, 29 (1942), No. 7, pp. 491-500, figs. 2).—This paper presents the broad outlines of the geographical distribution of the genus which have emerged as a result of monographing the group for North America north of Mexico and as a result of collecting 11,000 plant specimens, including several hundred sheets of *Ranunculus*, in the field. Combined with an interpretation of the distribution of the genus is an attempt to classify the many vegetation areas with which it is associated and to point out the significance of *Ranunculus* in defining major floristic areas and in determining the possible origin and relationships of the North American complex of floras. There are 24 references.

Sinopsis de la flora del Cuzco.—I, Parte sistemática [Synopsis of the flora of Cuzco.—I, Systematic part]. F. L. HERRERA (*Lima, Peru: Govt.*, 1941, vol. 1, pp. 528, [pl. 1, figs. 13]).—This taxonomic synopsis includes the cryptogams, bryophytes, pteridophytes, and flowering plants.

New grasses from Venezuela, Z. LUCES (*Jour. Wash. Acad. Sci.*, 32 (1942), No. 6, pp. 157-166, figs. 10).—Ten new species and one new combination are included.

New bamboos from Venezuela and Colombia, F. A. McCURE (*Jour. Wash. Acad. Sci.*, 32 (1942), No. 6, pp. 167-183, figs. 8).—Seven new species, one new combination, and one new genus (*Elytostachys*) are included.

Zur Kenntnis der Mykorrhizabildner von Kiefer und Fichte [The mycorrhizas of pine and spruce], O. MODERSS (*Symb. Bot. Upsal.*, 5 (1941), No. 1, pp. 147, pls. 3, figs. 27).—A monographic study, with bibliography and index to the fungi concerned.

Oxidation and assimilation of glucose by the root nodule bacteria, R. H. BURRIS and P. W. WILSON. (Univ. Wis.). (*Jour. Cell. and Compar. Physiol.*, 19 (1942), No. 3, pp. 361-371, figs. 5).—Increased oxidation of glucose by a strain of *Rhizobium trifolii* from the action of 2,4-dinitrophenol could be induced either by adding it initially or after assimilation of glucose was complete. Hence, with the *Rhizobiums* it is unnecessary to postulate an inhibition of assimilation to explain the increased substrate oxidation. Oxidation of the storage products of the cells, probably gums, was stimulated by the presence of $m/10,000$ dinitrophenol. Glucose in the presence of washed *Rhizobium* cells grown on a yeast-extract medium without added carbohydrate disappeared when oxidation was far from complete. Strains vary in their ability to oxidize and assimilate glucose. Washed cells of another strain, even when grown in the presence of sugar and relatively low in N, gave no more than one-fourth complete oxidation of glucose in the absence of dinitrophenol. The low percentage oxidation of glucose by cells grown on the yeast-extract medium is thus not necessarily attributable to their high N content.

Influence of aeration and soil temperature on the development of inoculated and noninoculated soya plants, M. M. GUKOVA and W. S. BUTKEVICH (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 31 (1941), No. 9, pp. 937-940, figs. 3).—In some cases the yield of legumes was increased not only by additions of N to the soil but also by creating more favorable conditions of aeration and temperature for the activity of the nodule bacteria. It is believed probable that in these more congenial conditions for N fixation lies the reason

why in certain reported studies the products of N fixation were observed to pass into the surrounding medium.

Growth of *Rhizopus suinus* as affected by certain growth factors, C. L. WORLEY. (Univ. Ga.). (*Plant Physiol.*, 17 (1942), No. 2, pp. 278-288).—The hitherto reported effects of yeast extracts on *R. suinus* have been diverse and contradictory. In general, the author's preliminary tests indicated that yeast itself (or accompanying portions of the cake) contains water-soluble stimulators and inhibitors, the latter being removable by adsorption on Nuchar-W or by solution in 95 percent ethanol. Results with tests of thiamin, mesoinositol, and biotin tended to suggest the possibility that the stimulant in yeast extract may be one or both of the first two, and that the inhibitor is not a component of bios but rather an unknown, or possibly heteroauxin. Since a parallelism existed between the effects on growth and on asexual reproduction for all tests with yeast extracts and synthetic bios components, these factors affect the fruiting only indirectly through altered vegetative growth. Liver infusion and urine both gave marked positive results, in agreement with those obtained on other fungus species. *Rhizopus* filtrate (substance-B) showed the presence of a biologically produced growth factor effective not only on other fungus species as previously shown, but also on the growth and asexual reproduction of *R. suinus* itself.

Comparative growth studies on a proliferation-promoting extract from ultraviolet injured yeast cells, known bios components and amino acids, E. S. COOK and A. G. CRONIN (*Studies Inst. Divi Thomae, Athenaeum Ohio*, 3 (1941), No. 1, pp. 205-222, fig. 1).—The ability of cell-free filtrates from ultraviolet injured yeast cells (crude "wound hormone" preparations) to stimulate proliferation of *Saccharomyces cerevisiae* was studied in Reader's and Williams' media with and without adding known bios components (inositol, thiamin, biotin, pantothenic acid, and vitamin B₆) and 20 amino acids. A significant portion of the growth activity proved due to these known factors, but a definite part of the potency was found ascribable to other material or materials. The possible relationship of nucleic acidlike substances, selectively absorbing ultraviolet at about 2,600 a. u., to the wound hormones is discussed. The amino acids and the bios components (except thiamin) for the most part exerted slight effects or none on yeast respiration, and the wound hormone preparations caused only a 25 percent stimulation at concentrations of 0.5-1 mg. per cubic centimeter. There are 30 references.

The estimation, isolation, and identification of auxins in plant materials, A. J. HAAGEN-SMIT, W. D. LEECH, and W. R. BERGREN (*Amer. Jour. Bot.*, 29 (1942), No. 7, pp. 500-506, fig. 1).—A technic comparable in completeness of auxin extraction to the in vivo biological digestion method is described as being a hydrolysis at pH 10.5 for 48 hr. at room temperature. Isolation of the auxin extracted from corn meal by this procedure yielded crystals melting at 164°-165° C., identified as indole-3-acetic acid. Pseudo-auxin *a* was isolated from the hydrolyzed corn meal, indicating the presence of auxin *a* in the original material. There are 24 references.

Interactions of auxins in growth and inhibition, F. SKOOG, C. L. SCHNEIDER, and P. MALAN (*Amer. Jour. Bot.*, 29 (1942), No. 7, pp. 568-576, figs. 4).—Studying the effects on growth of indole-3-acetic and γ -phenylbutyric acids supplied separately and in mixtures by various standard methods in the oats coleoptile, the results showed that phenylbutyric acid might possess slight auxin activity, but when administered with indolebutyric acid its main effect was to inhibit the activity of the latter. The extent of this inhibition was a function of the relative concentrations of the two substances and is therefore ascribed to competitive action between them. Phenylbutyric acid in solutions or plant tissues

prevents quantitative estimations of their auxin activity (plant auxin or indoleacetic acid), and it cannot be effectively eliminated for analytical purposes by ether extraction, diffusion in agar blocks, or transport through plant tissues. Phenylbutyric acid does not possess the properties implied in the definition of a "hemiauxin." The increase in response to indoleacetic acid elicited in its presence under certain conditions is attributed to an acid effect or a slight auxin activity of high concentrations of phenylbutyric acid and its "sparing" action, especially on low concentrations of indoleacetic acid. The results conform to the view that auxin acts as a coenzyme. On this basis a scheme is presented for the action of auxins in growth stimulation and inhibition which affixes an important determinative role also to interactions between auxin and its enzyme substrate complex. It thus provides for the contribution of formative effects from the cell environment and nutrients, and avoids ascribing separate kinds of activity to different auxins to account for discrepancies in the types of response produced. Hence it emphasizes the immediate regulatory or correlative action of auxin in the growth process, and accounts for the ability of auxin to accelerate or inhibit growth as a quantitative manifestation of a single function rather than as the results of separate qualitative effects. There are 34 references.

Growth, auxin, and tropisms in decapitated *Avena* coleoptiles, F. W. WENT (*Plant. Physiol.*, 17 (1942), No. 2, pp. 236-249, figs. 3).—When oats coleoptiles were decapitated and at 0.5-1 hr. intervals a number of their properties measured, it was found that after decapitation the auxin content as determined by ether extraction slowly fell off to 50 percent after 2 hr. and then increased again. A similar curve was noted for growth rate, though the decrease was larger and especially after 2 hr. It is concluded that the growth rate is due to the amount of extractable auxin in the tissues. For diffusible auxin from the various coleoptile zones, immediately after decapitation only small and decreasing amounts of precursor could be collected from any part of the coleoptile, and no auxin, but after 2 hr. auxin production again became evident in the apical section. An almost identical behavior was found for geotropism and phototropism. It is concluded that geotropism curvature is due to an effect of gravity on the diffusible auxin. This work is said also to confirm the thesis that regeneration of the auxin production 2-3 hr. after decapitation accounts for the reappearance of geotropic and phototropic sensitivity and increased growth rate. There are 15 references.

Control of flowering with phytohormones, H. E. CLARK and K. R. KERNS. (Univ. Hawaii). (*Science*, 95 (1942), No. 2473, pp. 536-537).—By use of appropriate concentrations of certain synthetic growth substances, including α -naphthaleneacetic acid, naphthaleneacetamide, naphthalenethioacetamide, and a commercial product Fruitone, flowering in pineapple was induced in advance of the normal period or delayed until much later. Since the differentiation of the inflorescence itself was initiated, the results differed from earlier uses of the same or similar phytohormones in producing parthenocarpic fruits, hastening of flowering by seed treatments accelerating growth, or premature flowering of tobacco said to be due to hastening of the terminal growth after the flower buds had formed.

The distribution of auxins in bulbs of *Lilium longiflorum*, W. S. STEWART and N. W. STUART. (U. S. D. A.). (*Amer. Jour. Bot.*, 29 (1942), No. 7, pp. 529-532, figs. 4).—Large differences in relative amounts of auxin were found in different parts of Easter lily bulbs on November 13, 4½ mo. after harvest and after storage in moist peat moss at 70°-85° F. The apical 3 mm. of the stem axis contained about 1,000 times the concentration present in the scales and basal

plate. The rest of the stem contained one-fifth the relative amount in the apical meristem. During subsequent storage (November 13 to December 15) at 77° and with sufficient moisture for active growth, there was a continual decrease of auxin in the scales and stem. In the basal plate and stem tip there was an initial decrease followed by a definite increase of auxin. The possible relationships between auxin changes and growth responses of the bulbs are discussed.

Effects of fluorescein on plant growth, J. and H. SELLEI, A. MAYER, and F. W. WENT (*Amer. Jour. Bot.*, 29 (1942), No. 7, pp. 513-522, figs. 3).—The work here reported with beet, bean, marigold, and tomato confirms earlier studies (E. S. R., 86, p. 753), in which fluorescein was found to increase plant growth when applied at low concentrations and to inhibit it at high concentrations. Plants treated with low concentrations responded by producing heavier tops and roots and more fruits, and also by showing a qualitative improvement. Sand culture tests showed practically the same percentage increase as those carried out in plats in heavy adobe soil, indicating that the effect of fluorescein is general and not restricted to one kind of soil. Sand culture tests of short duration in the greenhouse and darkroom, when giving fluorescein of high and low concentrations to young tomato plants, showed that a definite acceleration or inhibition of stem elongation was evident within 3 days. A possible explanation of the mechanism of fluorescein action is discussed. There are 19 references.

Studies in pollen tube culture, W. A. BECK and R. A. JOLY (*Studies Inst. Divi Thomae, Athenaeum Ohio*, 3 (1941), No. 1, pp. 81-101).—In 2 years' artificial culture of pollens of over 125 species of monocotyledons and 50 of dicotyledons, a semisolid medium of agar containing 10 percent sucrose and a trace of yeast proved most favorable to optimum growth among those tried. Growth substances and vital stains were most effective when incorporated in the medium, and neutral red and methylene blue were the most favorable stains. Pollens from monocotyledons gave better results than those from dicotyledons, and pollens of the Liliaceae were best, though those from Amaryllidaceae were also good. Liliaceous pollen is large, remains viable for months, and carries a considerable amount of volatile oil which is of growth-promoting nature or serves as a vehicle for growth substances. The tubes, which develop quickly and vigorously, have a considerable diameter and are particularly well adapted for testing the physiological effectiveness of auxins. The pollens of *Hymenocallis* and *Amaryllis* were especially suited to studying development of the generative cell and hence are to be recommended for investigating bios factors. There are 28 references.

Plants' content of minor growth substances as affected by vernalization and photoperiodism, L. P. ŽDANOVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S.*, n. ser., 32 (1941), No. 8, pp. 584-587).—From data obtained in photoperiod tests with short- and long-day plants (seven widely separated species) and vernalization tests with winter and spring wheat, it is concluded that the content in minor growth substances (bios and ascorbic acid) in plants increases with the intensity of the growth processes and is not connected with transition to the reproductive phase.

Role of the invertase in the synthesis of starch by the vegetable cell, B. A. RUBIN and E. V. АЕТЗИКHOVSKAYA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S.*, n. ser., 31 (1941), No. 7, pp. 675-678).—The authors conclude from their studies that the two indispensable conditions for starch formation in a living cell are a sufficiently active amylase and an adequate amount of sucrose, which in turn is a product of the synthetic activity of invertase. It is believed that the rôle played by sucrose in building up starch gives grounds for classing invertase among the most important regulators of carbohydrate metabolism in the plant cell.

Influence of temperature alternation on the germinable power of hop seeds (*Humulus lupulus* L.), I. N. HOLUBINSKY (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S.*, n. ser., 32 (1941), No. 1, pp. 85-86).—The germination percentage and rate of soaked hop seed was increased by alternating temperatures, best results being obtained by first submitting to the low temperature for 5 days until swollen and then transferring to the optimum temperature for germination.

"Vegetable dynamics" and plant tissue cultures, P. R. WHITE (*Plant Physiol.*, 17 (1942), No. 2, pp. 153-164, figs. 10; *abr. in Science*, 95 (1942), No. 2473, pp. 520-522).—In this address the author points out the directions in which plant physiology has moved since the days of Stephen Hales and briefly outlines some of the new fields for further work, including a few examples to indicate the proved as well as potential scope of the sphere opened up by the tissue culture technic.

Cultivation in vitro of small *Datura* embryos, J. VAN OVERBEEK, M. E. CONKLIN, and A. F. BLAKESLEE (*Amer. Jour. Bot.*, 29 (1942), No. 6, pp. 472-477, figs. 6).—Isolated heart-shaped *D. stramonium* embryos as small as 0.15-0.2 mm. and as young as 10 days after pollination were grown aseptically in vitro in an agar medium containing dextrose, mineral salts, a mixture of physiologically active substances, and nonautoclaved coconut milk. It appears that in coconut milk at least three factors are present which affect the growth of embryos—a thermolabile factor causing both growth and differentiation, a heat-stable factor causing in some cases a calluslike growth but no differentiation, and a heat-stable factor which inhibits root growth and may be related to auxin.

Limitations of auto-irrigators for controlling soil moisture under growing plants, L. A. RICHARDS and W. E. LOOMIS. (Iowa Expt. Sta.). (*Plant Physiol.*, 17 (1942), No. 2, pp. 223-235, figs. 5).—Using corn, soybean, wheat, and oats grown in various soils in 6- and 10-in. double-wall irrigator pots, it was found that with low barostat tensions good moisture control was attained while the plants were small and there was no change in the average pot weight from day to day. With larger plants, however, when the daily transpiration loss was greater than about 100 cc. per day, it was not possible to maintain the soil moisture content, even with the reservoir water supply at tensions as low as 2-4 cm. of mercury. The range of usefulness of auto-irrigators for controlling soil moisture in plant experiments thus appears to be definitely overrated in the literature. Their limitations in the range of successful operation may be ascribed primarily to the slow rate at which drying soils absorb and transmit water, particularly when the soil moisture is under appreciable tension. The hysteresis effect in the relation between the soil moisture tension and content accounts in part for the fact that it is difficult for an auto-irrigator to rewet soil from which the moisture has been depleted by roots. Also, a very slight decrease in moisture content may cause a hundredfold decrease in the moisture conductivity or permeability of soils for unsaturated flow, and local decreases are probably characteristic of the soil immediately surrounding all roots that are rapidly absorbing moisture. The design and construction of the irrigator pots used proved fairly ideal, and they appear to have a definite usefulness in soil moisture control problems not requiring the rapid movement of moisture through the soil. There are 14 references.

A non-osmotic force in the water relations of potato tubers during storage, C. J. LYON (*Plant Physiol.*, 17 (1942), No. 2, pp. 250-266).—Measuring the osmotic quantities starting with freshly dug potato tubers and continuing until they collapsed in warm storage or sprouted in cold storage, the total osmotic pressure appeared to increase soon after storage was begun but fluctuated in characteristic ways during winter and spring. During storage the turgor pres-

sure exhibited some effect of water lost by evaporation but seemed to depend more on the apparent total osmotic pressures of the cells. It often increased toward the end of the storage season, particularly in tubers with the best keeping qualities. As measured by the sucrose solution in which the volume of the tissue remained unchanged, the net osmotic pressure in cold storage usually increased during winter but became smaller in early spring. In warm storage it was higher than in cold storage only if the tubers failed to keep well. The calculated net osmotic pressures were usually significantly larger than the observed values. This discrepancy is a demonstration and an approximate measure of a nonosmotic force, which appears in early storage and varies in size with season and storage temperature. It is comparable to the "secretion pressure" reported by others and to the excess "osmotic" pressure in living tissues over that in the same dead cells, as measured by the thermocouple method for freezing point depression. In potatoes, however, the basis for it is unidentified.

The relative osmotic value of enlarging cells, W. A. BECK (*Studies Inst. Divi Thomae, Athenaeum Ohio*, 3 (1941), No. 1, pp. 1-8).—To obtain further evidence of protoplasmic activity in cell enlargement, the osmotic value (molar concentration of agent inducing incipient plasmolysis) of hypocotyl epidermal cells of sunflower (*Helianthus annuus*) seedlings was determined. The order of recorded values (0.224 M and 0.193 M) was in harmony with previous studies of many different kinds of epidermal cells, and that of cells in the upper region was 0.031 M higher than in the lower region. The difference was not deemed sufficient to account for a tenfold enlargement of the cells, thus forcing the conclusions that the protoplasm must elaborate a sufficient amount of solute to make the enlargement possible without greatly reducing the cell sap concentration, and that the cell wall must have become "fixed" to such an extent that it could not return to its earlier form during plasmolysis. The protoplasm is evidently active in the process of growth by cell enlargement, as is indicated by the production of solute.

Response of *Cyperus rotundus* L. to five moisture levels, C. H. DAVIS. (Univ. Ariz.). (*Plant Physiol.*, 17 (1942), No. 2, pp. 311-316).—Each decrease in the minimum soil moisture percentage permitted before rewetting to saturation resulted in a significant decrease in the weight of tops of *C. rotundus*, a weed known in the South as nut grass. Tuber development was decreased significantly by decreased soil moisture from a point 2 percent below the moisture equivalent. Tuber-top ratios were higher than average when the soil moisture minimum was below the wilting coefficient and lower when the minimum was above the moisture equivalent. Tuber growth was increased 150 percent and top growth 250 percent by raising the frequency of watering from a minimum of 9 to a minimum of 18 percent. The 18 percent level of watering was nearly 100 percent better than the 12 percent, even though both series were assumed to have a continuous supply of available moisture. At least in pots, growth may apparently be checked by the availability of water in soil which is always wet above the wilting percentage.

The iron-manganese ratio in relation to the respiratory CO₂ and deficiency-toxicity symptoms in soybeans, I. I. SOMERS, S. G. GILBERT, and J. W. SHIVE. (Rutgers Univ.) (*Plant Physiol.*, 17 (1942), No. 2, pp. 317-320, fig. 1).—Normal plants free from pathological symptoms were produced only when the Fe-Mn ratio in the substrate had values between 1.5 and 2.5, and the highest yields of respiratory CO₂ also occurred within this range. Furthermore, it was apparent that within reasonable limits the absolute concentrations of these elements either in the substrate or in the plant can be of no great importance so long as they are present in the proper relation to each other.

Composition of alcoholic leaf extract and the entire leaf of Irish potatoes as indices of soil fertility, C. E. BEAUCHAMP (*Plant Physiol.*, 17 (1942), No. 2, pp. 165-178).—In continuation (E. S. R., 84, p. 306), analyses of alcoholic leaf extracts showed direct relationships between the amounts of N, P, and K in the fertilizers; the percentages of these in the alcoholic leaf extracts; and the resulting yields. The same relationship held when the individual contents of these elements in the entire leaves were correlated with the fertilizer treatments on the one hand and the resulting yields on the other. However, the contrasts between the various treatments were much more pronounced in the leaf extracts than in the entire leaves. The sums of the percentages of N, P, and K in the leaf extracts and in the entire leaves were also used to study the intensity of nutrition, and in both cases there was a very marked relationship between these percentages, the fertilizer treatments, and the yields. Complete fertilizer treatments resulting in similar yields showed similar N-P-K units in both leaf extracts and entire leaves, but the units on the entire leaf basis were high in N whereas on the leaf extract basis they were high in K. On either basis, minus-K fertilizer treatments resulted in a derangement of the N-P-K units, involving a decrease in the K and an increase in the N ratios. The leaf extracts exhibited a rather constant K-P ratio irrespective of the widely different treatments compared, and its significance is discussed. Both leaf extracts and entire leaves showed the same sequence in the Ca-Mg-K relationships. When K was high Ca and Mg, individually and collectively, were low, and vice versa. "The analysis of the entire leaves of potatoes, as well as that of the alcoholic leaf extract, may be used as indices of soil fertility deficiencies, or as indicators of the nutrition of the crop. When comparing soils differing widely in fertility either one or the other may be used, but when the fertility level between soils under comparison is not very pronounced better results will be obtained by using the alcoholic leaf extracts."

Application of the liquid extraction method for the determination of total organic acids in plant sap, T. L. ISAACS and T. C. BROYER. (Univ. Calif.). (*Plant Physiol.*, 17 (1942), No. 2, pp. 296-302, fig. 1).—The liquid extraction method for determining organic acids reviewed and the apparatus designed and described were successfully applied to excised barley root sap. There are 13 references.

Recent work on the structure of plant polysaccharides, W. Z. HASSID. (Univ. Calif.). (*Chron. Bot.*, 7 (1942), No. 3, pp. 135-137).—A brief review on cellulose, starch, glycogen, fructosans, glucosans, galactans, mannans, and microbial polysaccharides, with bibliography.

Origin and transformation of carbohydrates in plants, H. A. SPOEHR (*Jour. Chem. Ed.*, 19 (1942), No. 1, pp. 20-23).—An address.

A study of the chemical composition of soybeans during maturation, A. C. WOLFE, J. B. PARK, and R. C. BURRELL. (Ohio State Univ.). (*Plant Physiol.*, 17 (1942), No. 2, pp. 289-295).—Analyses of four soybean varieties at different developmental stages indicated that seed fat and protein are probably produced largely from substances brought into the seed from other parts of the plant at time of synthesis, rather than from the carbohydrates already stored therein. Special attention is called to the desirability of expressing certain data in terms of quantity per plant or plant part rather than only in terms of percentages of the whole sample. Various modifications in the usual analytical methods were employed to render them more suited to use with this type of fresh high-fat plant material. There are 18 references.

Development of plants growing under different light conditions as affected by mineral nutrition, M. C. ČAJLACHJAN and E. K. LUKOVNIKOV (*Compt.*

Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 32 (1941), No. 2, pp. 152-155, figs. 2).—In experiments with oats and millet it was found that under photoperiods unfavorable to reproduction (short day for oats and long day for millet), their development was not affected by varying the mineral rations over a wide range. Under these conditions, no amount of mineral nutrients used could bring the plants from vegetative to reproductive growth. However, when the light conditions were favorable for the reproductive phase, the mineral supply became a very potent factor in its development. The growth of both plant species always reacted to the store of mineral matter, but it was obvious that growth was also affected by day length, irrespective of mineral supplies. Further work is needed to determine whether this two-sided influence of mineral elements is a general characteristic of plants.

Växtodling i artificiellt ljus (konstljuskultur) med särskild hänsyn till tomat [Plant culture under artificial light with special reference to the tomato plant], B. ÅBERG (*Symb. Bot. Upsal., 4 (1941), No. 5, pp. 98, pls. 7, figs. 21; Ger. abs., pp. 79-88*).—A review (10-page bibliography) and monographic study.

Developmental physiology of the grass seedling.—I, Inhibition of the mesocotyl of *Avena sativa* by continuous exposure to light of low intensities, R. L. WEINTRAUB and E. D. MCALISTER (*Smithson. Misc. Collect., 101 (1942), No. 17, pp. [1]-10, pl. 1, figs. 4*).—The relationship between the growth inhibition of the oats mesocotyl and the intensity of the radiant energy causing it was determined for a number of relatively narrow wavelength bands of the visible spectrum, at low intensities the inhibition being proportional to the logarithm of the intensity. From these data a provisional action spectrum of mesocotyl inhibition was plotted which showed a single peak at about 6,600 a. u. and an indicated secondary maximum around 6,200 a. u.

On the photoperiodic after-effect, B. S. МОШКОВ (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 31 (1941), No. 7, pp. 699-701*).—On the basis of experimental work with *Perilla*, the photoperiodic aftereffect is accounted for by those physiological changes arising in the leaves when they are under the photoperiodic conditions optimum for the plant concerned. Whatever may be the nature of these processes, they are believed to have such an effect on the life activity of the leaves that the plant becomes able to form flowers and fruits under any photoperiodic conditions. On short day length the leaves of *Perilla* have passed a certain phase of their ontogeny (probably an irreversible phase) to acquire the power of bringing to flowering the growing points controlled by them. The subsequent return to vegetative growth is due to the formation of new leaves differing in their development from those preceding. Therefore, there is believed to be no need to resort to photoperiodic accumulation to explain the aftereffect.

Rate of photosynthesis in leguminous plants supplied with free or bound nitrogen, M. M. ГУКОВА and W. S. БУТКЕВИЧ (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 31 (1941), No. 9, pp. 933-936, figs. 5*).—It is concluded from the experiments outlined that inoculation of legumes and the nature of the N nutrition determined by it have considerable influence on the physiological processes of these plants and are able to produce considerable changes in their development.

Cytoplasmic inclusions in the glandular epithelium of the scutellum of *Triticum sativum* and *Secale cereale*, J. A. O'BRIEN, JR. (*Amer. Jour. Bot., 29 (1942), No. 7, pp. 479-491, figs. 32*).—It was found that as germination begins small vacuoles form in the cells through swelling and dissolution of aleurone grains present in the resting stage, and as it progresses these vacuoles enlarge

and coalesce. In these large vacuoles there appears a vacuolar material precipitable in fixation as a lightly staining homogeneous mass. This material, possibly protein in nature, disappears at the end of germination, when the cells are completely vacuolate and devoid of vacuolar material. Plastid primordia are present in the epithelial cells during germination, and they readily develop into plastids as starch grains form within them. Two types of non-plastid-forming mitochondria also occur in these cells, the first being represented by a profusion of minute granular bodies free in the cytoplasm and the second by a type preserved by certain fixatives, not freely dispersed, each composed of a filament and enlarged terminal portion, and localized in a characteristic solitary group. This group structure is not present in the granular cytoplasm but is contained within a homogeneous region indistinguishable from the precipitated homogeneous material. Though this region may be a highly specialized portion of the cytoplasm, the evidence at hand suggested a vacuolar nature, and a relationship of the structure with secretion is deemed likely. There are 16 references.

Cell growth and division in living root meristems, R. T. BRUMFIELD (*Amer. Jour. Bot.*, 29 (1942), No. 7, pp. 533-543, figs. 14).—When *Phleum pratense* seedlings were grown in a specially constructed moist chamber and groups of meristematic cells in the root tips photographed at intervals as they developed to maturity, each cell or its resultant complex was found to pass through two growth phases, elongation proceeding at a constant exponential rate in each. In the first phase the cell or complex elongated at about 5.4 percent per hour, and at its end the growth rate increased to about 41.2 percent. In the second phase the rate remained constant at 41.2 percent, falling off to zero at the end of this phase. Cell division occurred only during the first phase, which appears to be primarily concerned with the production of new protoplasm, as is the second with vacuole enlargement. The period of increasing growth rate apparently represents a transition from one growth phase to the other. The first phase occurred in a zone from the root tip to 0.14 mm. behind it, and the transition occurred in a second zone extending from 0.14 mm. to 0.31 mm. behind the root tip. The second growth phase took place in a zone extending from 0.31 mm. to 0.97 mm. behind the root tip, and in the basal end of this zone the rate fell rapidly to zero. Trichoblasts elongated less than hairless cells, the growth rate of the former increasing more gradually than that of the latter during transition from protoplasmic synthesis to vacuolization. No evidence of "rhythmic" growth was observed in root elongation, and the division process did not appear to influence the cell elongation rate.

Development of the ovule and the formation of the seed in *Plantago lanceolata*, G. O. COOPER. (*Univ. Wis.*). (*Amer. Jour. Bot.*, 29 (1942), No. 7, pp. 577-581, figs. 30).—A cytological-histological study of buckhorn or English plantain.

A nomogram for finding the areas of bean leaves, W. D. BATEN. (*Mich. Expt. Sta.*). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 3, pp. 290-292, fig. 1).—'Many agricultural research workers have interested themselves in the past few years with finding the areas of leaves of various plants. The areas were found in many instances by use of a planimeter from blueprints or tracings of the leaves. This usually requires a great deal of labor and time. . . . The purpose of this article is to show how the area of a bean leaf, which is composed of three leaflets, can be found quickly by a chart which is called a nomogram.' The area of a leaf is found from the nomogram by laying a straight edge on the length axis and the width axis and then reading where the straight edge crosses the

area axis. The area is the only item that is recorded. The amount of labor is reduced to a minimum by using this device, for all areas are found in the field without computation in the laboratory and removing a leaf from the plant.

Torsions and their analysis, R. SNOW (*New Phytol.*, 41 (1942), No. 1, pp. 1-12, figs. 9).—This is a review and experimental study of torsions in plants. There are nine references.

A study of the origin and development of the cormlet of gladiolus.—I, The morphology of the corm and its appendicular organs; II, Factors influencing cormlet production; III, Anatomical studies of the cormlet, M. J. T. GEIGER (*Gladiolus* [New England Gladiolus Soc.], 1941, pp. 56-85, figs. 8; 1942, pp. 52-71, pls. 7, figs. 3).

GENETICS

New paths in genetics, J. B. S. HALDANE (*New York and London: Harper & Bros.*, [1942], pp. 206, figs. 17).—A book is presented based largely on a series of lectures given at the University of Gröningen, Holland, on genetics and its relation to other sciences. A considerable part of the book deals with human relations and statistical aspects of the subject.

Amphidiploidy, T. H. GOODSPEED and M. V. BRADLEY. (Univ. Calif.). (*Bot. Rev.*, 8 (1942), No. 5, pp. 271-316).—Investigations of the incidence and significance of amphidiploidy have recently been stimulated by the discovery of technics which induce chromosome doubling and by improvements in their application. In fact, at least one-third of the known instances of amphidiploidy have been reported since 1937 and have been artificially produced. This critical review (219 references) considers the origin and experimental induction of amphidiploidy, the origin and character of naturally occurring amphidiploids, the morphological and physiological characteristics and the cytogenetics of amphidiploids, fertility and crossability, and the evolutionary significance and distribution of amphidiploids.

Inheritance of fertility in the lateral spikelets of barley, W. H. LEONARD (Colo. Expt. Sta.). (*Genetics*, 27 (1942), No. 3, pp. 299-316, figs. 2).—The inheritance of fertility in the lateral spikelets of barley was studied in the Mortoni variety (*Hordeum intermedium*). The fertile intermedium condition found in F_1 crosses between some two- and six-row barleys is due to the genetic constitution $VvII$. Homozygous partial lateral spikelet fertility found in Mortoni appeared to be due to a fertility allele of the infertile intermedium v. nonintermedium (Ii) factor pair. The allelic series for intermedium appeared to be I , I^h , and i , with infertility dominant over fertility. The nonintermedium v. fertile intermedium (I^hi) factor pair, from combined F_1 and F_2 data, was linked with that for hoods v. awns (Kk) with 14.32 ± 0.61 percent recombination. Kk is known to be located in group IV. I^hi was found to be inherited independently of factors located in groups I, II, III, V, and VI. A method of testing barley varieties for intermedium constitution is suggested.

Inheritance of smut resistance in hybrids of Navarro oats, G. M. REED (*Amer. Jour. Bot.*, 29 (1942), No. 4, pp. 308-314).—This oats variety has proved resistant to all known races of *Ustilago avenae* and *U. levis* tested. This condition has been utilized in breeding work, and the variety is interesting for analysis of the mechanism of resistance. Hybrids of Navarro and Hull-less inoculated with *U. avenae* race 1, based on F_1 and F_2 data, indicated a two-factor relation for inheritance, and a three-factor difference was indicated when inoculated with *U. levis* race 1 and race 7. However, these hybrids inoculated with *U. avenae* race 12 differed markedly from the results just noted. There was a high percentage of inoculated F_1 plants infected, and in the F_2 generation

there was a very small number of resistant and a great excess of segregating and susceptible progenies. In hybrids of Navarro and Black Mesdag, five factors for inheritance of resistance to *U. levis* races 7 and 9 and three for *U. avenae* race 12 were indicated. In the hybrid of Navarro and Gothland, inoculated with *U. avenae* race 1, two factors were indicated. All of the parental varieties, Navarro, Hull-less, Black Mesdag, and Gothland, are resistant to the Red Rust-proof race of loose smut. An occasional F_1 progeny of Navarro \times Hull-less and Navarro \times Gothland contained infected plants. No smutted plants were found in the F_1 progenies of Navarro \times Black Mesdag. There are 18 references.

Oppositional alleles causing cross-incompatibility in *Trifolium repens*, S. S. Atwood. (U. S. D. A.). (*Genetics*, 27 (1942), No. 3, pp. 333-338).—Two series of white clover plants were compatible as females with a plant homozygous for oppositional alleles ($SiSi$). In 26 of 27 resultant F_1 progenies of from 4 to 8 plants each, 2 intrastertile, interfertile groups were found, but only one group in the other progeny. Within each series, diallel crosses were made for all F_1 groups, and each F_1 group or its heterozygous parent was crossed as a female with 6 plants, homozygous respectively for 6 other alleles. Incompatible matings indicated that the 2 alleles under test were identical. Of 26 alleles tested in the first series, 25 proved to be different, and in the second series 34 of 41 were different.

Polyploids in the genus *Cucumis*.—Preliminary account, O. SHIFFRIS. (Cornell Univ.). (*Jour. Hered.*, 33 (1942), No. 4, pp. 144-152, figs. 5).—Colchicine-induced tetraploids of the cucumber exhibited in general the expected gigantic features, with accentuated serrations of the leaf margin the most outstanding peculiarity. The dimensional change in fruit shape associated with polyploidy depends apparently on the initial genic patterns involved, the level of chromosome multiplication, and in some cases on the physiological reactions of the tetraploid plants. Sterility as a character was accentuated by chromosome doubling due to the physiological reaction of the tetraploids and the initial increase of pollen and ovule abortion. Intercrosses between diploids and tetraploids were difficult to obtain, suggesting that tetraploids represent a distinctly isolated population.

Downy mildew resistance in cucumbers, J. M. JENKINS, JR. (S. C. Expt. Sta.). (*Jour. Hered.*, 33 (1942), No. 2, pp. 35-38, figs. 2).—In 1939 more than 80 lots of cucumbers, including commercial varieties and foreign introductions, were planted at the Truck Substation near Charleston, S. C. Many of the lots succumbed to downy mildew. Among the few resistant forms, China and Puerto Rico No. 37 were outstanding. Subsequent trials indicated that Puerto Rico 37 was less affected by the mildew fungus than the China variety. Crosses made between Puerto Rico 37 and Colorado, a desirable commercial variety, and between China and Colorado yielded F_1 progenies of intermediate resistance. In the F_2 , there were plants as resistant as the resistant parent, and the F_2 was being grown in the hope of obtaining resistant types of good quality. As far as could be established, no linkage existed between the factors for resistance and those governing earliness or fruit shape.

A cytological study of some species in the tribe Paniceae, G. W. BURTON. (Ga. Coastal Plain and Ga. Expt. Stas. and U. S. D. A.). (*Amer. Jour. Bot.*, 29 (1942), No. 5, pp. 355-359, figs. 27).—The somatic chromosome numbers in 27 races of 26 species are presented, with discussions.

[Genetic studies with livestock by the Florida Station]. (Partly coop. U. S. D. A.). (*Florida Sta. Rpt.* 1941, pp. 62, 63, 67-68, 173-174, 180-182, 205-206, 206-207, fig. 1).—Brief results are presented by D. J. Smith, C. H. Willoughby, A. L. Shealy, O. W. Anderson, Jr., N. R. Mehrhof, R. B. Becker, P. T. D. Arnold, A. H.

Spurlock, R. W. Kidder, V. E. Whitehurst, Jr., W. G. Kirk, and W. F. Ward of the fleece and mutton production by Hampshire, Columbia, and crossbred sheep; the relationship between temperature, egg weight, body size, and production in Single Comb White Leghorns; variations in the fertility of Rhode Island Reds; the breeding efficiency and depreciation in Florida dairy herds; meat and milk production of Devon cattle; purebred and grade Angus cattle and Columbia sheep studies; purebred and crossbred cattle under similar environmental conditions; and inbreeding and crossing light Sussex and Rhode Island Red poultry as influencing incubation and fattening.

Experimental breeding of dairy cattle for the Tropics, E. HARRISON (*Trop. Agr. [Trinidad]*, 19 (1942), No. 4, pp. 65-69).—A tentative experimental breeding plan is developed at considerable length. Suggested original crosses are Indian-type bulls on groups of milk-recorded European-type females and the reciprocal and European-type bulls of milk-proved breeding capacity on groups of Indian-type cows which are known as milkers.

Crossbreeding in swine: Does it offer an effective method for the improvement of market hogs? W. E. CARROLL and E. ROBERTS (*Illinois Sta. Bul.* 489 (1942), pp. 121-136).—The weights and mortality of purebred and crossbred swine from various sources involving more than 50,000 head do not support the belief that hybrids may be expected in the majority of crosses between the breeds to excel in vigor, growth rate, vitality, and efficiency of production. Crossbreds approach but do not excel the better purebreds. At the same time with the crosses there may be a grading-up process of poorer stock. The high degree of homozygosity attained with corn is not possible with swine.

Some effects of breeding purebred ewe lambs, J. H. LONGWELL (*North Dakota Sta. Bul.* 316 (1942), pp. 16).—Ewes which raised lambs as yearlings were lighter in weight at 18 mo. than ewes not bred until 1 yr. older, but the difference was made up at 30 mo. in Shropshires and 36 mo. in Hampshires. The difference never entirely disappeared in Southdowns. Fleece weights were the same for ewes bred as lambs or as yearlings, but in Southdowns the fleece weights were lighter for the ewes which reared lambs as yearlings. The study was conducted over a period of 7 yr. with 95 Hampshires, 133 Shropshires, and 75 Southdown ewe lambs, approximately one-half of which were bred at about 9 mo. of age and approximately one-half at about 21 mo. of age. The production of lambs and wool is given for the ewes at each age and of each breed and for those which did and did not breed or had living or dead lambs.

[Genetic investigations with poultry and sheep by the Wyoming Station] (*Wyoming Sta. Rpt.* 1941, pp. 10-11, 11-12).—Brief results are reported by M. O. North on studies of the inheritance of resistance to coryza (roup); also on the wool and lamb characters of crossbreds produced by Corriedale and Columbia rams mated with Rambouillet ewes.

[Poultry breeding investigations by the Arizona Station] (*Arizona Sta. Rpt.* 1941, pp. 88-90).—Results are briefly reported on the development of high egg producing strains of White Leghorns, Barred Plymouth Rocks, and Rhode Island Reds; and strains of White Leghorns for low egg production and large and small egg size, with the development of strains for resistance to pullorum disease and range paralysis.

[Investigations in poultry genetics by the Massachusetts Station] (*Massachusetts Sta. Bul.* 388 (1942), pp. 95-97, 98-99).—Brief results are given by F. A. Hays, R. Sanborn, W. C. Sanctuary, and J. H. Vondell of progress on investigations relating to genetic study of Rhode Island Red and Orpington color; rapid and slow feathering in the Rhode Island Red; selective breeding for reducing mortality in Rhode Island Reds; the inheritance of intensity of egg production

and egg size in the domestic fowl; fertility cycles in ♂s; the physiological relationships between molting behavior and fecundity; breeding studies for the combination of meat and egg production in Barred Plymouth Rocks; and sexing Barred Plymouth Rocks by down and shank color and vent morphology.

Studies on the creeper fowl.—XIV, **The Japanese Bantam fowl**, W. LAN-DAUER ([Conn.] Storrs Expt. Sta.). (*Amer. Nat.*, 76 (1942), No. 764, pp. 308-317, fig. 1).—Several hundred incubated eggs from various crosses and inter se matings of creepers and Japanese Bantams and hybrids between them made it evident that the Japanese Bantam carries the creeper mutation or an allele of it. The greater survival of the homozygous embryos in the Japanese Bantam to late developmental stages than in the creepers seemed to be due to the action of an incompletely dominant modifier linked with the creeper factor. About 18-41 percent of all homozygotes lived beyond the early incubation stages. This study was conducted over several years with crosses made by artificial insemination.

Size genes of mice, W. E. CASTLE. (Univ. Calif.). (*Natl. Acad. Sci. Proc.*, 28 (1942), No. 3, pp. 69-72).—In carrying further studies of the relation of genes for pink eye, lethal yellow, and brown to size in the mouse (E. S. R., 86, p. 28), crosses were arranged to produce more than 500 litter mates in both sexes of pink-eyed brown ($aa\ bb\ p.p_1$), pink-eyed yellow ($A^y\ a\ bb\ p.p_1$), brown ($aa\ bb\ P.p_1$), and yellow ($A^y\ a\ bb\ P.p_1$). All were homozygous for b . The pink-eye gene decreased body size less than the lethal yellow raised it as regards body weight and length, but not as regards tail length.

[Physiology of reproduction in animals] (*Fed. Proc. [Fed. Amer. Soc. Expt. Biol.]*, 1 (1942), No. 1, pt. 2, pp. 33, 41, 63, 67, 119).—Abstracts are given of the following papers presented at the annual meetings of the American Physiological Society and American Society of Biological Chemists; Forty-eight-hour Response to Androsterone in the Immature Male Rat, by R. R. Greene and M. W. Burrill (p. 33); Further Studies in the Metabolism of Progesterone, by M. M. Hoffman and J. S. L. Browne (p. 41); Effects of Oestrogenic Hormone in Thyroidectomized Rats, by W. O. Nelson (p. 63); Nutrition of the Rabbit Ovum in Vitro, by G. Pincus (p. 67); and A New Method for the Preparation of Chorionic Gonadotropic Hormone, by P. A. Katzman, M. Godfrid, C. K. Cain, and E. A. Dolsy (p. 119).

The role of the endocrine glands in growth, reproduction, and lactation, C. W. TURNER. (Mo. Expt. Sta.). (*Missouri Acad. Sci. Proc.*, 7 (1942), No. 4, p. 94).—This brief abstract indicates something of the importance of the anterior pituitary in the initiation and control of secretions from various endocrines related to growth, reproduction, and lactation.

Attempts to stimulate proliferation of the germinal epithelium of the ovary, K. F. STEIN and E. ALLEN (*Anat. Rec.*, 82 (1942), No. 1, pp. 1-9).—Mitotic proliferation of the germinal epithelium was stimulated by the injection of oestrone directly into the ovarian capsule of normal and hypophysectomized mice. Support is thus given to the idea that cyclic proliferation of the ovaries through the follicular fluid may aid cellular proliferation. Histological study was made of the mitosis of the ovarian tissues 8-36 hr. after injection of the right ovary and 9 hr. after colchicine treatment. The left ovaries were frequently uninjected or injected with sesame oil as controls. Increases in mitotic activity did not occur in less than 30 hr. after injection.

The effect of growth hormone injections on the costochondral junction of the rat rib, R. D. RAY, H. M. EVANS, and H. BECKS. (Univ. Calif.). (*Anat. Rec.*, 82 (1942), No. 1, pp. 67-75, pls. 2).—Several points of difference as well as similarity were observed in the epiphyseal cartilage of the tibia and the costochondral cartilage of the rib of 18 rats up to 150 days of age. There was increased tissue metaplasia in the connective tissue of the deep layer of the perioste-

teum following injection of growth hormone. The effects were essentially opposite after hypophysectomy.

Effect of oestrin injections on the mouse ovary, W. S. BULLOUGH (*Nature* [London], 149 (1942), No. 3775, pp. 271-272).—The bursting of the graafian follicles at ovulation in normal mice releases follicular fluid rich in ♀ sex hormone which causes the postovulation peak in mitotic activity and replenishment of the ovary with a new stock of oogonia. In conducting the study, groups of 4-12 ♀ mice were injected with 1-5 doses of 250 I. U. of oestrin at 12-hr. intervals during di-oestrous. Counts of the number of mitoses varied from 25 in controls to an average of 747 after five injections of oestrin with colchicine 9.5 hr. before autopsy.

The influence of certain hormones on the carbohydrate levels of the chick, W. R. C. GOLDEN and C. N. H. LONG (*Endocrinology*, 30 (1942), No. 5, pp. 675-686).—Blood sugar levels in chicks were about 200 mg. percent with decreases of about 10 mg. percent during fasting. The carbohydrate values for liver and muscle were likewise high for the chicks as compared with mammals. The effects of insulin, anterior pituitary, and adrenal extracts on blood sugar in chicks were also investigated.

Specificity of fowl and mammalian antigonadotropic sera, H. S. KUPPERMAN, C. H. MELLISH, and W. H. McSHAN. (Univ. Wis.). (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 1, pp. 79-83).—Studies of the antigonadotropic serum produced by rabbits suggest that the gonadotropic complex of the chicken hypophysis is immunologically distinct from that observed for the mammalian gland and indicates that antigonadotropic hormones are immune bodies. The ability of antisera of different species produced by repeated injections to inhibit the gonad-stimulating effect of hormones from different animals on ovarian size of 21-day-old rats was ascertained. Chicken antigonadotropic rabbit serum, while inhibiting the gonadotropic action of chicken pituitary glands, was ineffective against gonadotropic extracts of sheep pituitary glands.

Influence of riboflavin-deficiency in eggs on embryonic development (*Gallus domesticus*), A. L. ROMANOFF and J. C. BAUERNFEIND. (Cornell Univ.). (*Anat. Rec.*, 82 (1942), No. 1, pp. 13-23, pl. 1, figs. 4).—Incubation of 1,268 fertilized but riboflavin-deficient eggs (*E. S. R.*, 82, p. 379) showed three critical periods in mortality at about 4, 14, and 20 days. The average embryonic mortality of these eggs was 87.5 percent. Prior to death there was a reduction in size of the riboflavin-deficient embryos, and shortened legs and prognathism were characteristic of the chicks from eggs deficient in riboflavin.

Relative growth of the shank (tarsometatarsus) in domestic ducks, H. CONNALLY and R. G. JAAP. (Okla. Expt. Sta.). (*Okla. Acad. Sci. Proc.*, 21 (1941), pp. 15-16).—The tarsometatarsus of the common duck was found to reach its maximum length at a very early age, but it increased in length at a slower rate than the body as a whole which was very rapid after hatching. The shank appeared to exhibit negative allometry during growth. From these results larger ducks would be expected to have proportionally shorter shanks than smaller ducks.

Effects of castration on feather weight in domestic fowl, K. B. TURNER. (Okla. Expt. Sta.). (*Okla. Acad. Sci. Proc.*, 21 (1941), pp. 93-94).—Although both capons and cockerels of the Barred Plymouth Rock breed continued to increase in body weight from 24 to 40 weeks of age, the differences were nonsignificant. By 24 weeks of age the feather weights of the capons were significantly greater than the cockerels, and at 40 weeks of age the minimum feather weight represented 7.6 percent of the body weight for capons and 6.3 percent for cockerels. The data were based on approximately 10 birds killed at about 5-week intervals.

FIELD CROPS

[Field crops research in Arizona]. (Partly coop. U. S. D. A.). (*Arizona Sta. Rpt. 1941*, pp. 29-36, 46-48, 74-79, 81-82).—Agronomic experiments (E. S. R., 85, p. 608) reported on from the station and substations included variety tests with cotton, grain sorghum, wheat, clover, castor-beans, soybeans, and green manure crops; breeding work with wheat (for smut and rust resistance), alfalfa, and cotton; experiments concerned with irrigation needs of cotton and depths of planting delinted seed; fertilizer tests with alfalfa and seed flax; effects of fertilizers, manure, and green manure on crops in rotations; seed production studies with alfalfa and sugar beets; cultural and interplanting (with hegarl) tests with soybeans and trials of soybeans and Sudan grass mixtures; date-of-seeding test with seed flax and green manure crops; economic value of some range plants under cultivation, including cockroach plant (*Haplophyton cymicidum*), yucca (*Yucca elata*), canaigre (*Rumex hymenosepalus*), and jojoba (*Simmondsia californica*); relation of climatic and grazing conditions to desert grassland range; food reserves of burroweed in relation to control practices; and control of bindweed, white horsenettle, and nutgrass by different methods.

[Field crops research in Connecticut] (*Connecticut [New Haven] Sta. Bul. 452 (1942)*, pp. 16, 18-19, 25-26).—Reports are made (E. S. R., 86, p. 32) by D. F. Jones, P. J. Anderson, et al., from tobacco experiments at Windsor (p. 796), including development of improved types of shade tobacco, fertilizer placement, and tests of relative efficiency of N carriers; and breeding and genetic investigations with corn concerned with transmission of combining ability of inbred strains of corn, changes in color and chemical composition of the aleurone and endosperm in highly aberrant stocks, sterility factors affecting pollen and ovule abortion, growth changes as associated with chromosome breaks and relocations at particular places, reciprocal translocations among chromosomes of a uniform long inbred strain of dent corn induced by X-ray treatment of the pollen, and naturally occurring changes in the rate of growth or in form among long inbred strains of corn.

[Field crops investigations in Florida]. (Partly coop. U. S. D. A.). (*Florida Sta. Rpt. 1941*, pp. 39-45, 45-56, 118-119, 128, 131, 132, 166, 167-176, 178, 180, 182-183, 198-200, 205, 206, figs. 5).—Progress reports are made again (E. S. R., 85, p. 608) from experimentation with field crops and related agronomic research at the station and substations by W. A. Carver, F. H. Hull, W. E. Stokes, J. P. Camp, G. E. Ritchey, W. A. Leukel, H. Mowry, R. E. Blaser, F. T. Boyd, F. Clark, M. N. Walker, M. N. Gist, C. S. Rude, E. N. McCubbin, A. H. Eddins, F. B. Smith, G. C. Wilson, G. M. Volk, H. W. Winsor, T. Bregger, F. D. Stevens, J. R. Neller, F. S. Andrews, W. T. Forsee, Jr., R. R. Kincaid, J. D. Warner, E. M. Andersen, W. M. Fifield, and W. F. Ward, including breeding work with corn, sweet corn, oats, sugarcane, and peanuts; variety tests with corn, oats, cotton, sugarcane for sugar and sirup, potatoes, peanuts, clover, lespedeza, grain sorghums, sorgo, and miscellaneous forage and pasture grasses and legumes and cover crops; strain tests with potatoes, pearl millet, sorghum, Napier grass, pigeonpeas, and *Indigofera hirsuta*; production tests with ramie and Alyceclover; fertilizer tests with sugarcane, potatoes, ramie, clover, lespedeza, Alyceclover, and Napier grass; study of development and deterioration of roots in relation to growth of pasture plants (Sudan and Bahia grasses) under different fertilizer and cutting treatments; fertilizer-cover crop experiments, nutritional sprays, and treatment of Dakota seed of the Bliss Triumph potato with tetrachloroethylene to break dormancy, all with potatoes; sugar-

cane studies, including physiology of blooming, the best depth of water table for cane and sugar production, and effects of the breeding of sugarcane on its utilization of P and K; cultural tests with corn, potatoes, grain sorghum, and peanuts; seed potato handling and storage; methods of inoculating legumes, particularly clovers and peanuts, in Florida soils; soil factors affecting the availability of the major elements in fertility studies with bright tobacco; effects of fertilizers, varieties, and cultural factors in production of flue-cured tobacco; tobacco plant bed fertilization; study of yield and quality of sea-island cottons, especially as to variety and effect of place of growth of seed; crop rotation studies with corn, cotton, crotalaria, and beggarweed, corn and runner peanuts rotating with crotalaria and with native cover crops, and corn in a 2-yr. rotation with crotalarials and weeds or natural land cover; and the effect of burning off weeds before spring plowing upon yield of succeeding crops.

Pasture research, in addition to that noted above, dealt with effect of fertilizer on yield, grazing value, and chemical and botanical composition of pastures; eradication of weeds in tame pastures; forage nursery and plant adaptation studies and forage and pasture grass improvement; growth behavior and relative composition of range grasses as affected by burning, and effects of burning on maintenance of natural grass stands and upon establishment of improved grasses; grazing value of certain grasses for pasture on cut-over, dry Norfolk sand areas; studies of pasture legumes, of Napier grass for pasture purposes, and of water pasture; and methods of establishing permanent pastures under various conditions.

Farm and garden crops (*Kans. State Bd. Agr. Bten. Rpt.*, 32 (1939-40), pp. 205-230, figs. 7).—Articles in this paging include Reestablishing Native Grass in Kansas, by L. C. Aicher (pp. 205-210) (Kans. Expt. Sta.); Improvement of Buffalo Grass in Kansas, by L. E. Wenger (pp. 211-224) (U. S. D. A. and Kans. Sta.); Madrid Sweet Clover, a New Crop, by J. W. Zahnley (pp. 224-227) (Kans. State Col.); and Spring Frost Escape Dates for Kansas, by R. L. Fox (pp. 227-230).

[Field crops research in Kentucky] (*Kentucky Sta. Rpt.* 1941, pp. 9-12, 17-18, 19-21, 47-48).—Field crops experiments at the station and substations (E. S. R., 85, p. 751), reported on briefly, included tobacco investigations embracing effect of manure on yield and quality of burley tobacco, fertilizer tests on soil experiment fields, fertility v. moisture in the growth of burley tobacco, row spacing of burley tobacco, vitamin B₁ in setting plants, priming the lower leaves of burley tobacco, and tobacco-curing experiments with burley and dark tobacco; tests of Kentucky bluegrass and other grasses in mixtures; alfalfa-grass combinations; nurse crops for grass or lespedeza; red clover-alfalfa mixtures; bluegrass and legumes v. bluegrass alone; effect of soil N level on bluegrass seed development; effect of B on the growth of soybean plants; breeding work with corn and hybrids and red clover (coop. U. S. D. A.); variety tests with corn and hybrids, red clover, soybeans, and castor-beans; and tests of dichloroethyl ether for control of dandelion and other weeds.

[Field crops work in Massachusetts] (*Massachusetts Sta. Bul.* 388 (1942), pp. 7-8, 9, 11, 11-12, 13, 13-15, 38-40).—Agronomic and related investigations again reported (E. S. R., 85, p. 752) by W. S. Eisenmenger, K. J. Kucinski, G. Wenzel, R. W. Donaldson, W. G. Colby, H. M. Yegian, and C. E. Cross included studies on the effects of preceding crop plants and application of commercial organic materials on yield and quality of tobacco; the influence of preceding plants and corn stover of high lignin content on brown root rot of tobacco; the absorption and excretion of K and Ca by the roots of barley in

different solution media and changes in pH; planting tests with sunflowers for seed; comparisons and production of hybrid corn; influence of soil fertility on productiveness of pasture species; comparison of a system of hay-pasture management with pasturing alone and tests of summer seeding of pasture mixtures v. spring seeding; variety tests with potatoes and oats; borax studies, including effects of 25- and 50-lb. per acre applications on field stands of alfalfa, especially in regard to deficiency symptoms, as yellows, and effects of 20-lb. applications per ton of fertilizer on potatoes; and control of weeds and shrubs of cranberry bogs by chemicals and a study of effects on bog weeds of flooding to kill root grubs.

[**Field crops research in Wyoming**] (*Wyoming Sta. Rpt. 1941*, pp. 4-5, 6-7, 29-31, 32-33, 34-37).—Experimentation (E. S. R., 85, p. 43) with field crops, range, and pastures at the station and substations, reported on briefly, comprised variety tests with winter and spring wheat, oats, barley, rye, grain sorghum, sorgo, corn (and hybrids), potatoes, peas, alfalfa for yield and wilt resistance, soybeans, and miscellaneous forage grasses and pasture mixtures; breeding and certification work with potatoes; cultural (including planting) experiments with corn, wheat, barley, potatoes, sugar beets, crested wheatgrass, brome grass, Sudan grass, and alfalfa; effect of a shelterbelt on yield of crested wheatgrass; fertilizer trials with wheat, potatoes, Sudan grass, and sugar beets; ordinary, grazed, manured, and fertilized crop rotations; methods of preparing seedbeds for different crops; pasture studies; tests of range grasses; and control of quackgrass by cultivation.

Rotation and fertilizer experiments in southwest Virginia, W. R. PERKINS, A. L. GRIZZARD, and T. B. HUTCHESON (*Virginia Sta. Bul. 339 (1942)*, pp. 15, fig. 1).—Experiments to determine the most desirable length of rotations and effects of different fertilizer treatments on crop yields in a 3-yr. rotation were conducted, 1930-41, on Dunmore silt loam at Glade Spring.

The 3-yr. rotations, corn, wheat or barley, red clover, 1 yr. each, returned the highest combined yields of all crops, gave more economical use of atmospheric N gathered by the clover than the longer rotations, and are particularly recommended for dairy farms and other farms where young animals and sheep are kept and in all cases where a limited acreage of suitable plowland is available. The 4- and 5-yr. rotations, if they do not necessitate plowing of steep land, may be useful on farms raising older beef cattle and horses. Where land is adapted to alfalfa production and much hay is needed the rotation consisting of corn 2 yr., followed by alfalfa and timothy 4 yr., may be used. On steep land a cover crop of crimson clover and ryegrass or rye alone may be sown between the two corn crops to reduce soil erosion and to provide some late-fall and early-spring grazing.

In the 3-yr. rotation corn, wheat, and clover hay, liming resulted in marked increases in yield and quality of corn and clover hay and also increased the efficiency of all fertilizers used. The largest percentage increases in the yields of corn, wheat, and clover and quality of corn followed the use of P. Additional increases in yields were obtained from NP or NPK. Fertilizer recommendations for the crops in rotations are based on the results.

Pastures to hold and enrich the soil, A. T. SEMPLE and M. A. HEIN (*U. S. Dept. Agr., Farmers' Bul. 1900 (1942)*, pp. 11+29, figs. 23).—Ways to use pasture or meadow best on seven classes of land that have differences in soils, slopes, susceptibility to erosion, and need for protective measures are outlined. The value of using pasture in livestock production is pointed out, and the importance of pastures in providing essential foods is emphasized. Examples of conservation planning for farms involving the use of pastures taken from the Corn and Cotton Belts are included.

The revegetation of abandoned cropland in the Cedar Creek area, Boone and Callaway Counties, Missouri, W. B. DREW. (Coop. U. S. D. A.). (*Missouri Sta. Res. Bul. 344* (1942), pp. 52, figs. 18).—Studies, 1940–41, in central Missouri revealed that the initial vegetation supported by abandoned cropland in the area is composed largely of weeds, chiefly annuals that coexisted with the last crop grown. On cornfields fall panic grass, large crabgrass, and common ragweed appeared to be the chief weeds. After small grains the important weeds included many of those of cornfields and a number characteristic to the small grains, including bracted plantain, lance-leaved ragweed, and trailing wild bean. After an initial period of 2–3 yr., abandoned cropland is gradually invaded by perennials, among which gray goldenrod, white heath aster, and sometimes broomsedge shortly become dominant, persisting in old fields for at least 30 yr. Native forage grasses, as bluestems, are comparatively unimportant in the natural revegetation process of most of the region, but may rarely invade pastures on Putnam soils.

Sassafras (the more abundant) and persimmon, both present as sprouts at the time of abandonment of many fields, are dominant among woody plants until 20–30 yr. or more after the last cultivated crop. Smooth and winged sumacs are the most abundant among shrubs in abandoned, ungrazed cropland in the area. Typical forest shrubs, as aromatic sumac, do not become established naturally in former cropland until an arborescent canopy has developed in the late old-field stages of plant succession. Oaks, hickories, elms, ash, maple, and other forest species appear gradually to invade old fields as seedlings become established. Post and shingle oaks and shagbark hickories are commonly present as sprouts and seedlings in early stages of old-field development, whereas white oaks mostly appear as seedlings late in old-field development. In the oldest fields studied, 30–35 yr. after abandonment, sassafras and persimmon are still prominent, and typical forest species, although then dominant, are not at all comparable in frequency and density to those of second-growth woodlands in the vicinity, thus suggesting a long interval prerequisite for reestablishment of such forest conditions.

Presence of a community of a lespedeza (*Lespedeza virginica*) and a panic grass on dry western or southern sites where 75–100 percent of the topsoil had been removed was the outstanding relationship observed between a plant community and site factors, including degree of erosion. Different species of algae, chiefly of the Myxophyceae, are common in the soil of abandoned cropland, but these studies indicated that such cryptogams are not important as pioneering plants on eroded soil.

Range forage production in relation to time and frequency of harvesting, R. LANG and O. K. BARNES. (Coop. U. S. D. A.). (*Wyoming Sta. Bul. 253* (1942), pp. 32, figs. 4).—Clipping experiments at the Archer Substation, 1940–41, showed that short grasses, *Bouteloua gracilis* and *Buchloe dactyloides*, yield more when harvested frequently at ground or crown level than when protected during the growing season and harvested after growth ceases. This held true even on areas harvested in this way for 2 yr. without apparent decrease in density of perennial grasses. Midgrasses yielded significantly higher under protection and harvesting at the end of the growing season than under frequent clipping. Annual forbs, like the midgrasses, yielded lower under frequent clipping, whereas perennial forbs reacted like the short grasses in giving a higher yield under frequent clipping. Indications were that on a short-grass range a system of grazing which would use some forage during June and July and the remainder at the end of the growing season would give a greater amount of more palatable forage than a system which deferred grazing until the end of the growing season. The smaller amount of forage received by frequent grazing of a mid-

grass range possibly would offset in quality the extra quantity received by end-of-season grazing.

Estimating the value of range forage for grazing use by means of an animal-unit-month factor table, M. A. SHIPLEY, C. E. FLEMING, and B. S. MARTINEAU (*Nevada Sta. Bul.* 160 (1942), pp. 26, figs. 2).—The system of range forage appraisal developed takes into account the density or degree of ground covered and the quantity of air-dry forage produced by range plants under proper use. Determination of carrying capacity under proper use is facilitated by an animal-unit-month factor table and a grazing capacity gage by which the percentages of an area occupied by various plants may be converted readily into animal-unit-months of feed produced.

Hay mixtures in the Upper Peninsula of Michigan, B. R. CHURCHILL and E. VANDERMEULEN (*Michigan Sta. Quart. Bul.*, 24 (1942), No. 4, pp. 322-325).—Alfalfa, alsike, and red clover sown alone and in mixtures with timothy or smooth brome grass at Chatham were cut for hay, 1938-41. In general, mixtures including either timothy or smooth brome with legumes produced more forage than the pure cultures. Alfalfa was the most effective legume in producing high yields, and all mixtures with alfalfa produced more hay per acre than did alfalfa alone. Timothy and smooth brome grass were of equal merit as to yield when combined with alfalfa, alsike, or their mixtures. Individual crops apparently could be added to the mixtures at different rates without appreciably changing the yields.

Corn and oats, H. O. WEST (*Mississippi Sta. Bul.* 368 (1942), pp. 127, figs. 16).—Information compiled largely from reports of experiments by State experiment stations covers a comparison of corn and oats as to production on Mississippi farms, labor requirements, feed for livestock, and harvesting machinery; varieties, seedbed preparation, planting dates and rates, and fertilizers and other fertility practices for both crops; corn cultivation; harvesting oats; and control of oats smut.

Combine vs. binder-separator harvesting for quality barley, J. W. THAYER, JR. (*Michigan Sta. Quart. Bul.*, 24 (1942), No. 4, pp. 294-298).—Analyses of barley samples collected from combines and separators operating in the Thumb district in 1940 showed that with the binder-separator (35 samples), combine-standing grain (45), and combine-windrow grain (30), respectively, 80, 66, and 53 percent of the samples were classed as bright or slightly stained; had 11.3, 11.3, and 9.3 percent of moisture; 46.8, 47.8, and 45.9 lb. per bushel test weight; and 71.4, 37.8, and 56.7 percent of the samples had from 0 to 5 percent of skinned and broken kernels. There appeared to be a better chance of obtaining high-quality barley by harvesting the crop with a binder and threshing with a separator than by use of a combine. Adjusting the machine, waiting until grain is dry before starting harvest, and frequent checking of the condition of separated grain with necessary adjustments are suggested.

Ladino white clover for the Northeastern States, E. A. HOLLOWELL (*U. S. Dept. Agr., Farmers' Bul.* 1910 (1942), pp. [2]+10, figs. 6).—Practical information is given on the characteristics and adaptation of Ladino clover (*Trifolium repens*); fertilizers, seedbeds, and planting; its use for pasture, hay and silage, and cover crop; diseases and insects; and seed production.

Cotton spacing in the Yazoo-Mississippi Delta, H. A. YORK (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 7, p. 2).—Results of cotton spacing tests at Stoneville, 1925-39, are reported briefly.

Sugar-beet culture in the intermountain area with curly top resistant varieties, B. TOLMAN and A. MURPHY (*U. S. Dept. Agr., Farmers' Bul.* 1903 (1942), pp. 11+52, figs. 29).—Cultural and field methods and harvesting prac-

tices approved for growing sugar beets in Colorado, Utah, Idaho, Oregon, and Washington are described, with advice on control of curly top and other diseases, nematodes, and insects. Major factors in sugar beet production in the region are use of curly top-resistant varieties, cultural practices, seed sources, climate, soil requirements, and irrigation supply. The information given supersedes that in *Farmers' Bulletin* 1645 (*E. S. R.*, 64, p. 834).

Studies of the production of sweet potatoes for starch or feed purposes, W. D. KIMBROUGH (*Louisiana Sta. Bul.* 348 (1942), pp. 13).—Date of planting and digging experiments and spacing tests largely with Triumph sweetpotatoes on Lintonia silt loam, 1938–41, supplemented by determinations for moisture, reducing and total sugars, and starch, showed that highest yields could be had by setting plants in the field as soon as possible after danger from cold injury is passed, i. e., from April 15 to May 15 in south Louisiana. Spacing of from 2 to 3 ft. in the rows, farther apart than for table stock, is advised. Yield data indicated that the longer growing season resulted in the higher yields. Since a growing period of 4 mo. was shown to be needed for fair yields, mills cannot begin operations before August or probably not until September. For the growers, October and November are the best months for harvest so far as yield is concerned. As earlier diggings may be necessary for the mill, proportionate allotments should be made to all growers supplying the mill, and these should come from early plantings. Diggings more than a month after a killing frost may give inferior roots. Tests to date show that the seedling L 4-5 is very promising and likely to replace Triumph as a starch and feed variety.

Tobacco Substation at Windsor, report for 1941, P. J. ANDERSON and T. R. SWANBACK (*Connecticut [New Haven] Sta. Bul.* 457 (1942), pp. 227–266, figs. 4).—Experimentation with cigar-leaf tobacco (*E. S. R.*, 85, p. 759) reported on dealt with fertilizers, amendments, irrigation, and plant bed covering. Accounts of frost damage, the incidence and control of diseases, and insect investigations are noted on pages 813, 822 of this issue.

The relative crop-producing capacity of urea and cottonseed meal (pp. 229–234).—Results of comparisons, 1937, 1939–41, indicated that urea N is at least 14 percent more efficient than cottonseed meal N in crop-producing capacity. In the 1941 crop urea did not increase the percentage of dark grades nor decrease the percentage of the better light grades. For the same quantity of fertilizer N the grade index was uniformly higher for tobacco receiving urea.

The effect of some sources of phosphorus on cigar leaf tobacco, T. R. Swanback, M. F. Morgan, and P. J. Anderson (pp. 234–239).—Calcium metaphosphate and triple superphosphate resulted in yields about 7 percent higher than no P, precipitated bone about 5 percent higher, and steamed bone equaled it, whereas yields with potassium metaphosphate and potassium calcium metaphosphate averaged 15 percent lower than no P. Only calcium metaphosphate of the materials tested produced tobacco decidedly superior in grade to that of the controls, and there was about 12 percent less "darks." Considering relative quality, the ranking of P sources tested would be calcium metaphosphate, precipitated bone, steamed bone, potassium metaphosphate, potassium calcium metaphosphate, and triple superphosphate. The phosphoric acid content of cured (air dry) tobacco ranged from 0.45 percent with calcium metaphosphate to 0.52 with triple superphosphate.

The effect of source on magnesium absorption by tobacco, T. R. Swanback (pp. 239–242).—Yields and grades of tobacco and leaf contents of Mg and Ca suggested that either magnesian limestone or hydrated lime may be used as a Mg source with about equal advantage, although the limestone might be safer in fertilizer mixtures. There may be a choice between these two materials when relatively small quantities of lime are needed, but if larger quantities (from

0.75 to 1 ton) are to be applied, calcic limes should be used to prevent a surplus of Mg in the leaf. The Mg requirement in the latter case is most readily met by inclusion of magnesian lime or $MgSO_4$ in the fertilizer.

Residual effect on stable manure (pp. 242-243).—The second crop after 10 yr. of heavy manuring did not show improvement in grading compared with no previous manure. An acre yield increase of 136 lb. (7 percent) was smaller than was shown the first year but still showed a residual effect 2 yr. after manuring.

Further experiments on starter solutions (pp. 243-244).—Relatively weak starter solutions were found beneficial, although sodium nitrate alone probably would benefit growth and quality better than mixtures of several nutrients. A suggestion is that not more than 3 gal. of a stock solution, as sodium nitrate 50 lb. to 50 gal. of water, should be used for a setter barrel.

Use of carbon black to activate growth early in the season (pp. 244-246).—Carbon black applied in 1941 at the rate of 850 lb. per acre in 4-in. bands on either side of the row seemed to accelerate nitrification processes greatly. Tobacco from control rows was judged of very good quality, with only a few starved (yellowish) leaves, while that from carbon black-treated rows was only fair, being somewhat coarse and including starved leaves. The somewhat higher yield from the carbon black treatment did not cover additional costs for material and labor.

Further information on irrigation of tobacco (pp. 246-247).—On a sandy soil irrigation alone may be more harmful than beneficial, for it resulted in a reduction of 26 percent in the crop value (crop index). When sodium nitrate was added to the water both yield and grade index were materially increased, with a gain of 15 percent in crop value. Results of previous experiments were confirmed.

Lumarith as a substitute for glass in seed bed sash (pp. 247-248).—Plants in beds covered by lumarith did not grow faster than those under glass nor show any difference in vigor or leaf color. Rows of plants from the glass-covered beds yielded higher, but the grading was a little better on the lumarith plants.

Physiological studies with the tobacco plant, G. M. WARD (*Canada Dept. Agr. Pub. 729* (1942), pp. 100, pls. 2, figs. 2).—Part 1 of this monograph considers mineral investigations, including some effects of K and of P on cigar tobacco, and mineral absorption studies with tobacco, including several trace elements. Part 2 covers carbohydrate investigations, including those in flue-cured and cigar tobacco. An appendix presents tables of analytical results from the mineral absorption experiments, and summaries and bibliographies conclude the various sections.

Distribution of the varieties and classes of wheat in the United States in 1939, J. A. CLARK and K. S. QUISENBERRY (*U. S. Dept. Agr. Cir. 634* (1942), pp. 75, figs. 67).—The distribution and acreages of classes and varieties of wheat are shown from surveys for the crop year 1939, based largely on seeded-acreage estimates, and are compared with the distribution in 1919, 1924, 1929, and 1934 (*E. S. R.*, 77, p. 478). The distribution of the more important wheats is shown on varietal maps, and estimated acreages and percentages of the total wheat acreage occupied by each variety or class in these years are tabulated by States and for the United States. Total acreage in the United States in 1939 in round numbers was 64 million acres, higher than the 1929-38 average of slightly less than 57 million acres, and compared with 61 million acres in 1934, 62 million in 1929, and 51 million in 1924. Decided acreage increases were in Oklahoma, Kansas, Nebraska, Montana, Missouri, Wyoming, California, Colorado, Iowa, and Idaho, and the largest decreases in acreage were in North Dakota, South Dakota, Indiana, Illinois, Michigan, Virginia, and South Carolina.

Thatcher, Tenmarq, and Blackhull made the greatest increases in percentage of acreage during the 1934-39 period, and Marquis, Turkey, and Ceres made the greatest decreases. Varieties grown on more than 1 million acres listed in order of importance included Turkey, Blackhull, Thatcher, Ceres, Tenmarq, Marquis, Kanred, Fultz, Trumbull, Fulcaster, and Kawvale.

Weak seed rightly blamed for some failures in stand. M. T. MUNN (*Farm Res. [New York State Sta.], 8 (1942), No. 3, pp. 7, 11, figs. 2*).—Germination tests showed plainly that many commercial stocks of certain kinds of seed, as well as those in farmers' seed bins, were not strong in vitality, especially those seeds the supply of which was very short and where every available source of supply was being used. Alaska peas, onion seed, corn, oats, and soybeans are examples.

Seed quality vital in all-out production; only high quality seed should be saved. B. THORNTON (*Colo. Farm Bul. [Colorado Sta.], 4 (1942), No. 3, pp. 22-23*).—A popular discussion.

Selective sprays for weed control in crops. L. E. HARRIS and G. R. HYSLOP (*Oregon Sta. Bul. 403 (1942), pp. 31, figs. 12*).—Almost complete control of many annual and certain perennial weeds found growing with grain, grass, peas, and flax crops was found possible by use of a new selective spray method developed in experiments, 1938-41. Combinations of sodium dinitro-o-cresylate (Sinox) with ammonium sulfate used as a selective spray were effective mainly in killing common broad-leaved weeds found growing with small grains, grasses, flax for fiber or seed, peas, and certain other specialty crops. On the other hand, the broad-leaved potato and vetch plants are effectively killed by the spray. Both of these chemicals contain nitrogen, which often has a pronounced fertilizing effect on the crop. Removal of weed competition also results in more moisture and plant food to support crop growth, and the yield and quality of crop may be increased materially. Grain yields were increased from 3 to 45 bu., common ryegrass to as much as 300 lb., and fiber flax 1 ton or more per acre. Equipment capable of complete and uniform coverage of weeds with spray under favorable weather is necessary for good results. Such spraying of weedy fields is estimated to be economically feasible.

Weeds in Kansas. F. C. GATES. (*Kans. State Col. (Kans. State Bd. Agr. Rpt., 60 (1941), No. 243, pp. 360, [pls. 4], figs. 397*).—This weed manual comprises individual descriptions, control methods, and illustrations for about 400 weeds grouped as I (20) noxious, pernicious weeds; II (43) weeds most commonly found in cultivated land, (18) in native prairies used as pastures or meadows, (11) along roadsides, railroads, and waste places, and (8) in lawns; and III about 300 plants not real weeds or not serious at present. A classified table of Kansas weeds, a bibliography, glossary, and index are included. General discussion is accorded the weed problem and eradication and control measures, especially for bindweed. Space is also devoted to insects and plant diseases harbored by common weeds, poisonous plants, hay fever plants, weeds infesting sports fields and orchards, and harm to the dairy industry and poultry caused by weeds.

HORTICULTURE

[Horticultural studies by the Arizona Station] (*Arizona Sta. Rpt. 1941, pp. 56-69, fig. 1*).—Included are reports on the following investigations: Lettuce fertilization, cantaloup and lettuce breeding and selection, vegetable variety trials, vegetable adaptation tests on the Yuma Mesa, vegetable and herb seed production, citrus fertilization, factors affecting quality and yield of grapefruit and of navel oranges, nitrogen uptake by grapefruit trees, climatic require-

ments of the pecan in the Yuma Valley, methods of top working pecan trees, relation of sunshine to winter dormancy in the pecan, treatments to overcome delayed foliation in the pecan, factors involved in the filling of pecan nuts, dates for harvesting pecans, date maturation and storage, date variety tests in the Tempe garden, and fruit and rootstock tests.

[**Horticultural studies by the Connecticut State Station**] (*Connecticut [New Haven] Sta. Bul.* 452 (1942), pp. 16-18).—Progress reports by D. F. Jones et al. are presented on the breeding of hybrid sweet corn, the effect of environmental factors on the color and sugar content of garden beets, and the breeding of hybrid summer squash, tomatoes, peppers, and strawberries.

[**Horticultural studies by the Florida Station**]. (Partly coop. U. S. D. A.). (*Florida Sta. Rpt.* 1941, pp. 79-84, 86-93, 100-101, 119-121, 133, 138-139, 143-149, 159-160, 172-173, 174-175, 192-195, 197-198, 199, 200, *figs.* 4).—Included are progress reports on the following studies by G. H. Blackmon, R. D. Dickey, R. J. Wilmot, F. S. Jamison, V. F. Nettles, L. B. Nash, A. L. Stahl, L. H. Rogers, W. Reuther, F. S. Lagasse, H. M. Sell, R. W. Ruprecht, J. R. Beckenbach, D. G. A. Kelbert, E. N. McCubbin, and E. Borda: Cooperative fertilizer tests in pecan groves; varieties of pecans and other nut-bearing species; propagation, planting, and fertilization tests with tung trees; chlorosis in ornamental figs; a "blight" or "rust" of gladiolus; cover crop tests in pecan orchards; phenological tests with truck crops; relation of nitrogen absorption and storage to growth and production in the pecan; little leaf of peaches; rootstocks for satsumas; the relation of soil reaction to growth and yield of vegetable crops; selection and development of varieties and strains of vegetables for commercial production in Florida; the effects of green manure crops on growth, yield, and quality of certain vegetables; fumigation of horticultural crops and nursery stocks with methyl bromide and HCN; effects of mineral deficiencies on the adaptability of certain vegetable varieties; the effects of Ba and Sr on growth, reproduction, and composition of tomatoes and soybeans; the cultural requirements of the mu-oil tree (*Aleurites montana*); the work of the U. S. Field Laboratory for tung investigations; soil, fertilizer, and variety studies with celery; lettuce variety and fertilizer tests; the relation of temperature and time of planting to several strains of crisp-head lettuce; cultural studies with crisp-head lettuce; the breeding and selection of tomatoes under local conditions; the suitability of various summer cover crops for sandy soils; cabbage production and variety studies; varietal and cultural trials with beets, carrots, spinach, peas, and lettuce; and nitrogenous fertilizers for citrus.

Studies are reported from the Citrus Substation by J. H. Jefferies, A. F. Camp, M. Peech, V. C. Jamison, F. F. Cowart, B. R. Fudge, W. L. Thompson, R. K. Voorhees, and W. W. Lawless on citrus progeny and bud selection, variety testing, and breeding; production and physiological studies with citrus; fruit quality studies, particularly as affected by nutritional treatments; and fertilizer requirements of citrus.

Studies from the Everglades Substation by G. R. Townsend, F. S. Andrews, and J. R. Neller include tree fruit trials and other introductory plantings, the puffing of tomatoes, water tables for truck crops, and variety tests with truck crops grown at different fertility levels.

From the Subtropical Substation studies are reported by S. J. Lynch, G. D. Ruehle, W. M. Field, and E. M. Andersen on citrus culture, avocado culture, the growing of various forest species, the testing of papayas, mangoes, and other minor fruits and ornamentals, and varieties of lima beans and lettuce.

[**Horticultural studies by the Kentucky Station**] (*Kentucky Sta. Rpt.* 1941, pp. 29-30, 30-31, 46-47).—Included are reports of soil management studies in

apple and peach orchards, the testing of early-maturing varieties of apples, mulching experiments with red raspberries, spraying of lima beans with naphthaleneacetic acid to reduce blossom drop, effect of potassium iodide on ascorbic acid content of tomato plants, and tests of fruit varieties by the Western Substation.

[*Horticultural studies by the Massachusetts Station*] (*Massachusetts Sta. Bul.* 388 (1942), pp. 8-9, 13, 40-43, 50, 56, 67-69, 75-78, 78-94, fig. 1).—Brief progress reports are presented on the following studies: The intake by plants of elements applied to the soil in pairs compared with the intake of the same elements applied singly and magnesium requirements of plants, both by W. S. Eisenmenger and K. J. Kucinski; onion breeding, by H. M. Yeglian; development of strains of cranberry resistant to false blossom and the oxygen content of winter flooding water in relation to injury to cranberry vines, both by H. F. Bergman (coop. U. S. D. A.); frost protection by a wind machine on a cranberry bog, by C. I. Gunness; breeding snapdragons for varietal improvement and disease resistance, cultural requirements of freesias, soilless culture of flowers, the liming of carnation soils, disease resistance and heredity in the carnation, and coffee chaff as a soil amendment, all by H. E. White; the testing of packet flower seeds, by C. L. Thayer; effect of plant growth-promoting substances on the rooting of Canada hemlock cuttings, propagation of mountain laurel, lilac, and juniper, factors affecting the growth of nursery stock, variety tests of herbaceous plant materials, hardiness of clematis varieties, factors influencing the hardiness of evergreens, and propagation of Mugho Swiss pine, all by H. S. Tiffany; variety tests of vegetables, tomato breeding, the mulching of tomatoes and peppers, sources of organic matter for greenhouse tomatoes, treatment of bean seed, and the testing of edible soybeans, all by W. H. Lachman and G. B. Snyder; shape index of tomatoes, sweet corn breeding, and testing of hybrid sweet corns, all by Lachman; treatment of cucumber seed, by O. C. Boyd and Lachman; improvement of asparagus by selection and vegetable breeding for improvement of quality, both by R. E. Young; influence of clonal rootstocks on apple varieties and bud sports of McIntosh apples, both by J. K. Shaw and L. Southwick; tree characters of fruit varieties, by Shaw, A. P. French, O. C. Roberts, and Southwick; genetic composition of peaches, by J. S. Bailey and French; soil management of apple orchards and effect of orchard mulches on plant nutrients of the soil, both by Shaw; testing of fruit varieties, by Shaw et al.; nature of winter hardiness in the raspberry, by R. A. Van Meter and French; storage of apples in modified atmospheres, by Southwick and Roberts; nutrition of highbush blueberries and blueberry culture, both by Bailey; premature dropping of McIntosh apples, by Southwick; and the use of lime and phosphorus in planting trees, ammonium sulfamate for killing weed trees and bushes, ethylene dichloride emulsion for the control of peach tree borers, and the use of sawdust as an apple tree mulch.

[*Horticultural studies at the University Station*] (*Agr. Expt. [Puerto Rico Univ. Sta.], 2* (1942), No. 3, pp. 1-2, 4-7, figs. 2).—This includes the following articles: *Cómo evitar y dominar las enfermedades en las hortalizas* [How to Avoid and Control the Diseases of Horticultural Plants], by L. A. Alvarez García (pp. 1-2); "La esponja vegetal o estropajo" [A Descriptive Account of the Vegetable Sponge], by J. I. Otero (pp. 4-5); *La pomarrosa Malaya en la producción de vino* [The Malayapple (Ohia) for the Manufacture of Wine], by J. S. Simons and R. Arroyo (pp. 5-7); and *La guanábana y su cultivo* [The Sour sop and Its Culture], by J. S. Simons (pp. 7-8).

[*Horticultural studies by the Wyoming Station*] (*Wyoming Sta. Rpt.* 1941, pp. 30, 31-32, 33, 33-34).—Brief reports of work at the State experiment farms

are presented on the results of variety tests with small fruits at Afton, fruits, vegetables, and shelterbelt trees at Eden, irrigation experiments with gardens at Gillette, and treatment of chlorotic apple trees at Lander.

Use of "hormones" becoming an important tool in the growing of horticultural plants, A. M. BINKLEY (*Colo. Farm Bul. [Colorado Sta.], 4 (1942), No. 3, pp. 18-21, fig. 1*).—Information is given on the nature and use of various growth-promoting substances in plant propagation, control of fruit drop, etc.

Vegetable crop research has many practical angles (*Farm. Res. [New York State Sta.], 8 (1942), No. 3, pp. 4, 11*).—The research activities of the station in the production of canning crops are discussed. Among studies mentioned are those on the fertilization of vegetables, the use of starter solutions, rotation experiments, variety testing and breeding, and freezing preservation.

Purity, germination, and yield of some vegetable seeds offered for retail sale in Ohio in 1941, H. D. BROWN, C. N. MCINTYRE, E. DOLEZAL, and R. HEDGES (*Ohio Sta. Bul. 629 (1942), pp. [1]+29, figs. 2*).—The data presented, largely in tabular form, showed that vegetable seeds whether sold in packet or bulk form may differ greatly in varietal purity and in germinating and yield capacities. Many of the lots did not conform to the standards established by the State law. Cabbage seed tended to be badly mixed as to variety and even with other species, and radishes and tomatoes showed also considerable mixture. The most uniform plants were observed among the beans, both lima and green types. In fact, all of the lima bean lots were true to type.

Wisconsin canning pea trials, 1937-1941, E. J. DELWICHE (*Wisconsin Sta. Res. Bul. 144 (1942), pp. [2]+36*).—In trials conducted over 5 yr. in different locations in the State, information was obtained on the comparative yields and quality of a large number of varieties of canning peas. The highest yielding varieties on the average for all locations over the 5 yr. were as follows: Early kinds, No. 28,57 Alaska, Ace, and Wisconsin Early Sweet; midseason kinds, Canner King, Early Perfection, and Improved Penin; and late varieties, Wisconsin Merit, Stuart Perfection, and Perfected Wales. Early wrinkled-seeded varieties, similar in maturity and canning use to Surprise, outyielded in several instances Alaska sown on the same dates. Midseason and late varieties were about equal in yield, and both groups outyielded early varieties by a significant margin. On sandy soils, peas grown in rows compared favorably in yield with broadcast plantings. The quality of canned peas did not differ significantly between maturity groups, or for varieties within groups, provided the peas were harvested at identical stages of maturity. Observations following a frost in May 1938 showed that certain varieties are apparently superior in resistance to low temperatures.

Seek new ways to expedite the breeding of new fruits, B. R. NEBEL (*Farm Res. [New York State Sta.], 8 (1942), No. 3, p. 15*).—A survey is presented of recent progress with X-ray and chemical treatments of plant tissues to induce genetic changes.

The new Close apple, W. TOENJES (*Michigan Sta. Quart. Bul., 24 (1942), No. 4, pp. 321-322*).—A descriptive account is presented upon the growth, fruiting habits, and fruit of a very early-ripening apple developed by and named for the late C. P. Close of the U. S. Department of Agriculture. Eating quality is rated as good if the apples are picked while firm. The color was bright red on fruits exposed to sunlight.

Spraying for control of preharvest drop of apples, C. W. SCHNEIDER and J. V. ENZIE (*New Mexico Sta. Bul. 294 (1942), pp. 15, fig. 1*).—Naphthaleneacetic acid and naphthaleneacetamide used separately at the approximate concentration of 0.001 percent were effective in reducing the preharvest drop of sound

Stayman Winesap apples. Of the two materials, the former was the more effective. The duration of the effective period was about 10 days to 2 weeks, and from 2 to 3 days were required following spraying before the materials became effective. Two applications of naphthaleneacetic acid were more effective than one early treatment, but not significantly more effective than one late application in reducing dropping of Stayman Winesap apples in 1941. Both chemicals reduced the dropping of wormy Stayman Winesap apples, but not to the extent of appreciably increasing the number of wormy fruits to be handled during harvesting. In trials with Winesap, naphthaleneacetic acid appeared to reduce the dropping of both sound and wormy fruits.

Recherches sur la conservation des pommes et des poires [The storage of apples and pears], H. FAES, M. STAHELIN, and P. AUBERT (*Landw. Jahrb. Schweiz*, 56 (1942), No. 3, pp. 207-277, figs. 15; *Ger. abs.*, pp. 273-277).—Studies of the storage requirements of a number of important varieties led to the following general conclusions: Not over 24 hr. should intervene between the harvesting and storing of early-maturing varieties of pears and apples, and late varieties should be stored within a 10-day period following harvesting. The most favorable temperature for storing apples was between 35.6° and 39.2° F. At temperatures around 32° there was danger of browning of the flesh. The most favorable relative humidity ranged between 85 and 90 percent, and humidities below 80 percent tended toward shriveling and those above 95 percent to mildew. Waxing is recommended for certain varieties with rough skin, such as Boskoop and Canada Reinette. Specific recommendations are presented for the various apples and pears under study.

Blackberries merit more attention, G. L. SLATE (*Farm Res. [New York State Sta.]*, 8 (1942), No. 3, p. 1).—Due to various reasons, such as partial sterility of the flowers, susceptibility to disease and drought, thorns, and softness of the mature fruits, blackberry culture has declined in New York State. Fine flavor is obtained only in the fully ripe fruits. Eldorado is the only variety recommended for general culture in the State.

The blueberry in New York, G. L. SLATE and R. C. COLLISON (*New York State Sta. Cir.* 189, rev. (1942), pp. 29, figs. 7).—This is a revised edition of an earlier noted circular (E. S. R., 83, p. 340).

The influence of various soils on the growth and productivity of the highbush blueberry, S. JOHNSTON (*Michigan Sta. Quart. Bul.*, 24 (1942), No. 4, pp. 307-310, figs. 2).—Plants of the Jersey blueberry, set in boxes containing different types and combinations of soil, responded very differently in growth and production. Plants in white sand alone or in reddish-colored underlying soil alone made very poor growth and produced very little fruit as compared with those in complete soil or in half surface soil and half white sand. In another trial in which plants were grown in soils of different pH values and different clay contents, it was evident that soil reaction was much more important than clay content. Apparently the highbush blueberry does not grow well in soils of a pH level greater than about 5.2.

Methods of splitting hevea seedlings, H. F. LOOMIS. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 65 (1942), No. 2, pp. 97-124, figs. 19).—Tests of the Ramaer and Gambar methods of dividing hevea seedlings indicated that the latter method gives the better results, as measured by more vigorous plants and shorter time required. Splitting of seedlings from which the main stem had been cut off just above the cotyledon bud resulted usually in the production of twin cotyledon plants that were equal to those produced from cotyledon sprouts of Gambar sections but not to those produced from main-stem sections. A method of direct planting of split seedlings without the necessity of digging them for

separation and transplanting is described. The division of seedlings from 10 days to 15 mo. old was attempted, and fair success was obtained with younger plants, pointing to the possibility of increasing the number of plants by splitting seedlings 3 or 4 mo. of age.

Trials of annual flowers, 1941, E. I. WILDE, C. B. LINK, and J. R. CULBERT (*Pennsylvania Sta. Bul. 426 (1942), pp. [2]+52, figs. 5*).—Information is presented on the results of extensive tests of various annual flowering plants, especially marigolds. Descriptive notes on the varieties are presented in tabular form.

Blooming dates of some selected hardy perennials, H. S. TIFFANY (*Massachusetts Sta. Bul. 392 (1942), pp. 55*).—In tabular form data are presented on the blooming period, color of the flowers, and the plant height of a selected list of hardy perennials. To facilitate the selection of a succession of flowers, the material is arranged in three groups—spring, summer, and fall flowers.

Tulip bulb production in the Upper Peninsula, P. KRONE, J. G. WELLS, and P. BOWSER (*Michigan Sta. Quart. Bul., 24 (1942), No. 4, pp. 280-287*).—Trial plantings of tulip bulbs at Chatham and Jacobsville indicated the possibilities of successful culture in the Upper Peninsula, with yields comparing very favorably with those obtained in the Kalamazoo area. Weight increases varied from 2.3 to 5.07 times the weight of the original bulbs planted. The general quality of the bulbs was excellent, and preliminary forcing trials indicated that they would force satisfactorily.

Care of damaged shade trees, R. P. MARSHALL (*U. S. Dept. Agr., Farmers' Bul. 1896 (1942), pp. II+34, figs. 23*).—Superseding Farmers' Bulletin 1726 (E. S. R., 72, p. 628), this contains information on the causes of tree wounds and how they may be avoided, healing and treatment of wounds, types of wounds requiring special treatment, repairs to damaged trees, etc.

The planting and maintenance of lawns, D. G. STURKIE and H. S. FISHER (*Alabama Sta. Cir. 85 (1942), pp. 20, figs. 16*).—General information is presented on the selection of grasses and ground covers, preparation of the soil designed for a lawn, establishment of lawns by seeding and by sodding, care and maintenance of lawns, and the control of weeds, insects, diseases, and various other pests.

FORESTRY

[Forestry studies by the Connecticut State Station] (*Connecticut [New Haven] Sta. Bul. 452 (1942), pp. 24-25*).—Among studies by M. F. Morgan et al., the progress of which is noted, are the effect of soil types on the root development of forest trees, the nutritional requirements of forest nursery stock, and the effect of different methods of slash disposal on the soil and on the growth of trees.

Trees of Puerto Rico, I. L. R. HOLDRIDGE (*U. S. Dept. Agr., Forest Serv., Trop. Forest Expt. Sta. Occas. Paper 1 (1942), pp. [2]+105, figs. 50*).—In this first of a projected series descriptive information is presented on 50 species.

Tree growth and the environmental complex: A critique of "ring" growth studies, with suggestions for future research, A. W. SAMPSON and W. S. GLOCK. (Univ. Calif. et al.). (*Jour. Forestry, 40 (1942), No. 8, pp. 614-620*).—This report of a conference held at the University of California in August 1941 places much emphasis on the complexity of environmental factors influencing tree growth and on the biometric difficulties involved in attempts to correlate tree growth with rainfall. It was agreed that extensive experimental studies under controlled conditions are needed and that the cooperation of plant physiologists, ecologists, climatologists, soil scientists, etc., is essential.

Parthenocarpy, parthenogenesis, and self-sterility of Douglas fir, G. S. ALLEN (*Jour. Forestry*, 40 (1942), No. 8, pp. 642-644).—Controlled experiments in British Columbia indicated that the Douglas fir may be highly self-sterile and that parthenogenesis may occur to a limited extent. Since neither pollination nor fertilization had any apparent effect on the growth of the cones, examination of the seeds is the only way to determine the results of pollination. Parthenocarpy is a normal condition in the species, and the seeds are usually empty. Abortions of immature conelets were nonexistent in the bagged series, with the evidence indicating that the critical period is the time of bud bursting and emergence of the conelet. Cross-pollination is evidently one of the major factors influencing seed quality in the Douglas fir.

Will girdling always kill Douglas fir? T. J. STARKER. (Oreg. State Col.). (*Jour. Forestry*, 40 (1942), No. 8, pp. 658-659).—The fact that certain trees survived for 13 yr. following complete girdling is ascribed to natural root grafts with nearby ungirdled trees.

Effect of soil aeration on the foliation of black locust seedlings, T. S. COILE and R. N. GAISEE (*Jour. Forestry*, 40 (1942), No. 8, pp. 660-661, fig. 1).—Tests made of the effects of aerating A and B horizons of three Piedmont soils of black locust seedlings showed a significantly greater number of plants foliated in horizon A than in horizon B. However, the rate of foliation did not prove to be different for the horizons. Plants growing in aerated soils showed significantly higher foliation than those in nonaerated, and the production of leaflets in the aerated soils progressed significantly faster than in the non-aerated soils.

On the range of Shumard red oak (*Quercus shumardii* Buckl.), H. H. CHISMAN. (Pa. State Col.). (*Jour. Forestry*, 40 (1942), No. 8, p. 658).—Information is presented on the northern limits of the species.

Propagation of a rapid growing semi-evergreen hybrid oak, W. S. FLORY, JR., and F. R. BRISON (*Texas Sta. Bul.* 612 (1942), pp. 32, figs. 11).—Of various methods employed in an attempt to propagate some desirable oaks (known as Ness hybrids) obtained by the station from crosses of the live oak *Quercus virginiana* and *Q. lyrata*, whip and bark grafting on compatible stocks were most successful. A wide series of treatments of cuttings taken from the original 30-year-old hybrids gave negative results. Cleft grafting was only moderately successful, due apparently to the difficulty of obtaining good fits with large caliber wood. As to stocks, the results indicated that these hybrid oaks may be successfully grafted on various white oak stocks. Black oak species, on the other hand, were generally incompatible.

Combining the Christmas tree plantation and livestock pasture on cut-over lands of good fertility, A. BERRIDGE (*Michigan Sta. Quart. Bul.*, 24 (1942), No. 4, pp. 277-280, fig. 1).—In a 13-yr. trial of a combination of pasture and white spruce planting the results suggested that such a combination is a satisfactory method for producing Christmas trees and at the same time some pasture returns. The livestock ate the competing grasses and, so long as there was an abundance of green pasture, caused no material damage to the trees. The combined returns from trees and pasturage yielded a very satisfactory net income.

Estimating volume on the spot; J. W. MACON and S. R. GEVORKIANTZ. (U. S. D. A.). (*Jour. Forestry*, 40 (1942), No. 8, pp. 652-655, figs. 3).—A tally form, combining the functions of both tally sheet and volume table, is presented as a practical method for making rapid and reliable estimates of timber volume directly in the forest.

DISEASES OF PLANTS

The Plant Disease Reporter, [August 1 and 15, 1942] (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr.*, 26 (1942), Nos. 14, pp. 305-316, figs. 4; 15, pp. 317-340, figs. 6).—In addition to the host-parasite check-list revision, by F. Weiss (Nos. 14, *Salix* concluded, and 15, *Samanea* to *Sassafras*), the following are included:

No. 14.—Bacterial leaf spot (*Phytophthora viburni*) of *Viburnum*, by H. W. Anderson and H. H. Thornberry; bacterial ring rot of potato in Arizona, by W. G. Hoyman; and brief notes on potato late blight in New York, bacterial blight of Persian walnut in New York, and dodder on petunia.

No. 15.—Incidence of ear rots in the 1941 corn crop, by N. E. Stevens; miscellaneous notes (mostly North Dakota) on diseases of cereals and grasses, and diseases of vegetable crops and ornamentals, by R. Sprague; cereal diseases in North Central States, by H. O. Putnam; some fruit diseases in Pennsylvania, including cherry viruses, powdery mildew on cherry, *Cylindrosporium* leaf spot on red raspberry, fire blight (with tabulation of blossom blight on apple trees in central Pennsylvania 1942), and brown rot on wild plum, by G. L. Zundel; a lethal virus disease of cantaloup occurring in the Imperial Valley, by J. T. Middleton and T. W. Whitaker; notes on some diseases of ornamentals, including *Colletotrichum trichellum* on stems of *Hedera helix*, stem canker and foot rot of *Vinca minor*, and top blight of rhododendron, by F. Weiss; reports on potato late blight from Massachusetts, New York, Virginia, Minnesota, and Iowa; recent observations on diseases of truck crops, potato, and tobacco in Massachusetts, by O. C. Boyd; and brief notes on wheat nematode spread in South Carolina, two diseases (*Bacterium papavericola* and *Sclerotinia sclerotiorum*) of poppy in Oregon, and bean anthracnose very severe in Virginia.

Index to Supplements 121-128, N. W. NANCE (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr.*, 1940, Sup. 129, pp. 379-403).

Report of the 1942 annual meeting of the southern division of the American Phytopathological Society (*Phytopathology*, 32 (1942), No. 7, pp. 647-651).—Abstracts of 15 papers on plant diseases and/or their control are included.

[**Plant disease studies by the Arizona Station**]. (Partly coop. U. S. D. A.). (*Arizona Sta. Rpt. 1941*, pp. 7, 79-81, 82-87, figs. 3).—Brief reports are given on studies of boron toxicity to crops, including grapefruit; bacterial wilt of alfalfa; bacterial necrosis of the giant cactus; dry root rot of citrus associated with *Fusarium* spp.; *Alternaria* infection of cotton bolls; cotton stubs, seed, and wind as sources of black arm-angular leaf spot infection; southern *Sclerotium* wilt and root rot of cotton; cotton rust (*Puccinia schedonnardi*) incidence; effects of various chemicals on the growth of *Sclerotinia sclerotiorum*; control of *Phymatotrichum* root rot of pecan trees; potato bacterial ring rot in Arizona; damage by race 56 of wheat stem rust; and plant parasites new to the State.

[**Phytopathological studies by the Connecticut [New Haven] Station**]. (Partly coop. U. S. D. A.). (*Connecticut [New Haven] Sta. Bul. 452* (1942), pp. 12, 15-16, 19-22, 27).—Brief reports of progress by R. B. Friend, W. O. Filley, J. G. Horsfal, P. J. Anderson, et al., are presented on control of white pine blister rust; *Alternaria* defoliation of tomatoes; fungicidal control of apple scab; meeting the fungicide shortage; Dutch elm disease pathogenesis and control; chemotherapeutic trials with yellow-red virosis (X disease) of peach; and chemistry of "black" tobacco, and downy mildew control in seedbeds.

[Phytopathological studies by the Florida Station] (*Florida Sta. Rpt. 1941*, pp. 56, 71-72, 93-97, 101-118, 123, 139-141, 170, 171-172, 175-176, 180, 184-185, 195, 196, 200-204, figs. 9).—Brief summaries of progress, by J. P. Camp, J. R. Watson, H. E. Bratley, W. B. Shippey, L. H. Rogers, R. A. Carrigan, A. N. Brooks, D. G. A. Kelbert, G. F. Weber, R. K. Voorhees, M. N. Walker, W. B. Tisdale, G. D. Ruehle, K. W. Loucks, E. West, L. O. Gratz, A. H. Eddins, G. R. Townsend, and R. R. Kincaid, are presented on sulfur dusting of peanut for *Cercospora* leaf spot; root knot control by selection of resistant host plant strains, mulching, and rotation; seed and seedbed treatments for celery and other vegetable diseases; control of early (*Cercospora*) and late (*Septoria*) blights of celery; control of lettuce downy mildew; control of fungus leaf and stem diseases, *Fusarium* wilt, and late blight (*Phytophthora*) of tomato, and field observations on other diseases of this crop; dusting for downy mildew of cucumbers; calcium cyanamide for strawberry bud nematode; comparative study of *Diplodia* forms resembling *D. frumentii*; investigation and control of *Fusarium* wilt and other fungus diseases, and an abnormal auxiliary proliferation in watermelon; bark disease of Tahiti lime trees; fruit rots of grape; host relations and factors influencing the growth and parasitism of *Sclerotium rolfsii*; causes of failure of vegetable seed and seedlings in various Florida soils and development of preventive methods; *Phomopsis* blight and fruit rot of eggplant; *Ovulinia* flower spot of azalea; camellia dieback disease; zinnia leaf spot and mildew; potato disease control, including bacterial ring rot, scab, spindle tuber and leaf roll, and early and late blights; potato rot found due to *Xylaria apiculata*; investigations and control of bacterial brown rot of potato and related crops; control of *Rhizoctonia* diseases of potato and vegetable crops; a "healed holes" condition of potato tubers of suspected insect origin; "striped dwarf" of corn; fungicidal and ethylene chlorohydrin treatments of seed potatoes; vapo-dusting of potatoes, celery, tomatoes, and beans; bean breeding in relation to rust and powdery mildew resistance; cabbage dusting and spraying for downy mildew and black rot and seed treatments for damping-off; citrus scab and its control; melanose and stem-end rots of citrus fruits; hard spots or gum pockets in grapefruit rinds controlled by borax sprays; tobacco varieties resistant to black shank and root knot; tobacco downy mildew control; culture practices for reducing root knot infestation of tobacco; zinc deficiency, scab, and dictyospermum scale, and fruit blotch and black spot of avocado; poinsettia scab; and mineral deficiencies of loquat, orange jessamine, and pitanga (*Eugenia uniflora*).

[Plant disease work by the Kentucky Station] (*Kentucky Sta. Rpt. 1941*, pp. 13-17).—Brief reports are presented on tobacco disease control by the development of resistant varieties, including White Burley Ky. 16 resistant to root rot and Ky. 33 resistant to *Fusarium* wilt, and mosaic-resistant strains for burley and dark tobacco; a virus disease of burley tobacco shown to be due to the *Plantago major* virus; certain legume viruses found transmissible to tobacco; phosphorus starvation causing leaf spotting of tobacco, and sources of bacterial leaf spot infection.

[Phytopathological studies by the Massachusetts Station]. (Partly coop. U. S. D. A.). (*Massachusetts Sta. Bul. 388* (1942), pp. 15-18, 21-28, 78).—Brief reports are presented, by C. V. Kightlinger, M. A. McKenzie, A. V. Osmun, W. L. Doran, E. F. Guba, C. J. Gilgut, H. E. White, L. H. Jones, and H. S. Tiffany, on studies of tobacco black root rot, brown root rot, and soil treatments for damping-off and weeds in the seedbed; the Dutch elm disease in the State, its spread by *Scolytus multistriatus*, and its control; other diseases of elms and other trees and the importance of tree disease studies in relation to national defense; damping-off and growth of seedlings and cuttings of

woody plants as affected by soil treatments and environal modification; diseases of ornamental herbaceous plants due to soil-infesting organisms and their control; chemical soil-surface treatments in hotbeds for controlling damping-off of early forcing vegetables; susceptibility of *Lycopersicum* spp. to *Cladosporium* leaf mold; causes and control of decay in stored squashes; *Phomopsis* stem canker of gardenia; disease resistance and heredity in carnations; apple scab control; copper dusts for cucumber and muskmelon; mercurials for crucifer club root control; vegetable seed treatments for damping-off control; effect of vitamin B₁ at different soil temperatures on gardenia chlorosis; and powdery mildew on garden phlox.

Parasitic fungi of Wisconsin, J. J. DAVIS (*Madison, Wis.: Democrat Ptg. Co., 1942, pp. [1]+157*).—This posthumously published list constitutes a record of collections in the University of Wisconsin herbarium and in the author's personal herbarium, also located at the University of Wisconsin. It comprises a compilation of various previously published reports, including A Provisional List of Parasitic Fungi in Wisconsin.¹ Indexes to hosts and fungi are provided. The foreword is by E. M. Gilbert.

Twenty-first annual report of the Canadian Plant Disease Survey, 1941, I. L. CONNERS (*Canada Dept. Agr., Sci. Serv., Plant Disease Survey Ann. Rpt., 21 (1941), pp. [1]+XVIII+102*).—The same general plan is followed as in previous reports (E. S. R., 86, p. 490).

Plant pathology.—Progress report for the season 1939–40, G. M. WICKENS (*Empire Cotton Growing Corp., Expt. Stas. Prog. Rpts., 1940–41, pp. 43–64, fig. 1*).—On diseases and insect pests of the cotton boll, with brief notes on *Verticillium* wilt of cotton and *Fusarium* wilt of sunn hemp.

The genus *Cerebella* Cesati—its biologic status and use, R. F. LANGDON (*Phytopathology, 32 (1942), No. 7, pp. 613–617*).—The literature on this genus is reviewed, and further evidence is presented to show that its members are saprophytic on carbohydrate-rich materials, the commonest substratum for the fungus being the sugary honey-dew secretion associated with the *Sphacella* stage of *Claviceps* spp. The need for a revision of the species of *Cerebella* is pointed out. Four points arise from a knowledge of the relation between *Cerebella* and the plants on which it is found—(1) the name should be removed from the host indexes and *Sphacella* substituted, (2) *Cerebella* provides a natural control of ergot by inhibiting the development of sclerotia, (3) it is a good field indicator of the presence of ergot, and (4) the history of ergot in a country may be traced through old records of *Cerebella* on grasses.

Nuclear phenomena involved at meiosis in *Coleosporium helianthi*, L. S. OLIVE. (Univ. N. C.). (*Jour. Elisha Mitchell Sci. Soc., 58 (1942), No. 1, pp. 43–51, pls. 2*).—A cytological study of this rust, common in the North Carolina area, with its uredinial and telial phases on *Helianthus* spp. and its aecia and pycnia on *Pinus echinata* and *P. virginiana*.

Cuatro nuevos Deuteromicetos Colombianos [Four new Colombian Deuteromycetes], R. OBREGÓN BOTERO (*Caldasia, No. 3 (1941), pp. 49–51, fig. 1*).—Four new leaf-parasitizing species of *Cercospora* are described.

Cross inoculations with isolates of *Fusaria* from cotton, tobacco, and certain other plants subject to wilt, G. M. ARMSTRONG, B. S. HAWKINS, and C. C. BENNETT. (S. C. Expt. Sta. Coop. U. S. D. A.). (*Phytopathology, 32 (1942), No. 8, pp. 685–698*).—Inoculations with the wilt *Fusaria* from *Cassia tora*, cotton, tobacco, okra, tomato, watermelon, and cowpea were made chiefly by a solution-culture technic, though some soil inoculations were also used. The isolates from cotton, okra, *Cassia*, and tobacco from South Carolina and

¹ Wis. Acad. Sci., Arts, and Letters, Trans., 17 (1914), pt. 2, No. 2, pp. 846–984.

Kentucky caused wilt with these various hosts, one fungus apparently being involved. A susceptible burley tobacco was attacked, but a flue-cured variety (Gold Dollar) showed little or no wilt. Tobacco isolates from Maryland, however, caused wilting of both the burley and the flue-cured tobacco, but not of cotton or okra. The weed *C. tora*, found growing in cotton fields, was attacked by the cotton-wilt fungus. The tomato, watermelon, and cowpea fungi are probably pathogenic only to their respective or closely related hosts, since the tomato fungus did not cause wilt of watermelon, okra, or cotton, the watermelon fungus did not cause wilt of tomato, and the cowpea fungus attacked neither cotton nor *Cassia*. There are 19 references.

Life history and taxonomy of the fungus *Physalospora rhodina*, R. K. VOORHEES (*Florida Sta. Bul.* 371 (1942), pp. 91, figs. 16).—Continued collection and study of different forms of this complex and variable group (*Diplodia* and related genera) on different tropical and subtropical host plants has convinced the author that, primarily, different forms or physiologic races of only a few specific fungi are being dealt with. The large number of destructive diseases and the wide geographical and host distribution of the many forms considered has led to a multiplicity of names, many of which might well be included under one binomial. The main purpose of this study was therefore to demonstrate that the collections of *Diplodia* from different tropical and subtropical hosts made by the author and others should be included under *P. rhodina*. Of the several hundred single-spore isolates of *P. rhodina* from southern United States and other tropical or subtropical sources, about 100 were studied in detail, the results indicating an indefinite number of races very similar in appearance but often differing in one or more characters. It became clear that many of these races arise in the sexual stage in nature. Practically all of them were differentiated by aversion reactions in culture, and often also by growth and growth rate, pigmentation, and perithecial type. It was shown that the factor or factors for sex are carried by the ascospores in different ratios in the ascus. The general morphological characters of the conidial and perithecial collections are described. Certain races showed slight differences in pathogenicity but no definite host specialization. The morphological differences among the many conidial collections of *P. rhodina* studied are not considered wide enough to merit specific distinction. These isolates and certain forms described by others as distinct species are therefore included in the synonymy of *P. rhodina*. There are at least three distinct species of *Physalospora* that are not distinguished by their *Diplodia* stages. Hence it is entirely possible that many of the *Diplodia* forms included under *P. rhodina* may have their sexual stages in undescribed species of *Physalospora* and other genera. There are 86 references.

The Plasmodiophorales, including a complete host index, bibliography, and a description of diseases caused by species of this order, J. S. KARLING (*New York: Author*, 1942, pp. IX+144, figs. [648]).—Following the introduction (including glossary and bibliography), the individual chapters deal respectively with the cytology, sexuality and alternation of generations, classification and description of species, phylogeny and relationships of the order, and diseases caused by specific members of the group.

A new *Rozella* of the polysporangiate series, L. SHANOR. (*Univ. Ill.*) (*Jour. Elisha Mitchell Sci. Soc.*, 58 (1942), No. 1, pp. 99–101, pl. 1).—*R. achlyae* n. sp., parasitizing *Achlya flagellata* (Phycomycetes) is described and illustrated.

A further note on the nitrogen metabolism of *Stereum gausapatum* Fries, J. A. HERRICK and C. J. ALEXOPOULOS (*Ohio Jour. Sci.*, 42 (1942), No. 3, pp. 109–111).—In continuation (*E. S. R.*, 83, p. 636), it was found that growth on media containing peptone, asparagine, or $-\text{NH}_4$ ions as the only source of N

is greatly increased by adding minute amounts of thiamin. With NH_4NO_3 growth was roughly proportional to the thiamin content of the medium. Growth on media containing only $-\text{NO}_3$ ions as N sources was negligible, even with thiamin present. Lack of growth in such cases was shown not to be due to toxicity. This fungus is therefore able to use asparagine and NH_4 salts, in addition to peptone, as sources of N, the thiamin content acting as a limiting factor.

Lipolytic activity of phytopathogenic bacteria determined by means of spirit blue agar and its taxonomic significance. M. P. STARR and W. H. BURKHOLDER. (Cornell Univ. et al.). (*Phytopathology*, 32 (1942), No. 7, pp. 598-604).—The comparative abilities of 206 cultures (65 species and varieties) of phytopathogenic bacteria (genus *Phytomonas* Bergey et al.) to decompose cottonseed oil were determined by this method. Its value as a taxonomic character was indicated by the fact that each of the recognized groups of this heterogeneous genus has a characteristic reaction on spirit blue-cottonseed oil agar. Of 24 species and varieties of *Xanthomonas* (members of the "*P. campestris* group"), 21 were actively lipolytic by this procedure; of 27 green-fluorescent pigment-producing phytopathogenic *Pseudomonas* species, only 4 were lipolytic; and of the tested species of phytopathogenic *Corynebacterium* ("gram-positive group"), of the gall-forming "*Phytomonas tumefaciens* group," or of the miscellaneous "*P. stewartii* group," none were actively lipolytic by this method. The taxonomy and nomenclature of the plant-pathogenic bacteria are discussed, particularly in the light of this study.

A simple technique for aseptic handling of media. J. A. HERRICK (*Phytopathology*, 32 (1942), No. 7, pp. 636-637).—The simple technic outlined is suggested especially for use in cases where equipment is very limited or where it is impracticable to set up more elaborate apparatus.

Coacervates in physical and biological systems. J. DUFRENOY and H. S. REED. (Univ. Calif.). (*Phytopathology*, 32 (1942), No. 7, pp. 568-579, figs. 6).—Coacervate formation in vacuoles of hypoplastic cells is believed due to a change in equilibrium between the diffused colloidal material and the surrounding liquid. The globular coacervated aggregates consist of a central mass of phenolic material surrounded by a layer of phospholipoids. These coacervates occurred only in abnormal cells of orange and sunflower plants deprived of Zn or other essential trace elements. Equilibrium change may be so abrupt as to allow no time for complete outward diffusion of the vacuolar sap, a portion of which is imprisoned as "vacuoles" within the coacervate. Cellular hypoplasia was also indicated by starch accumulation in the plastids, by filiform mitochondria, and, in extreme cases, by lysis of the cell contents. Under disease conditions plastic materials were used not for plant maintenance but in forming coacervated aggregates in the cell vacuoles.

Catechol aggregates in the vacuoles of cells of zinc deficient plants. H. S. REED and J. DUFRENOY. (Univ. Calif. and La. State Univ.). (*Amer. Jour. Bot.*, 29 (1942), No. 7, pp. 544-551, figs. 8).—Knowledge of the cellular inclusions apparently characteristic of many diseased cells is advanced by new developments in technic here outlined. These spherical inclusions in cell vacuoles of Zn-deficient plants are said to be formed by a process in which some of the colloidal material in the vacuolar solution becomes condensed into a spherical mass instead of being distributed at random in the solvent. These aggregates may be formed by a process of coacervation, which to a certain extent may be considered a separation of phases. However, they have a boundary layer which is more than the theoretical interphase, being a precipitation membrane composed of oriented molecules. In the cases studied, the mass of the aggregates appeared to be made up of catechol, and the precipitation membrane or

bounding layer was a phospholipoid, identifiable by suitable chemical reagents. Coacervated aggregates were found in the vacuoles of hypoplastic cells of leaves and in the postmeristematic cells of growing shoots of apricot trees with the little leaf Zn deficiency, as well as in leaf cells of walnut trees with the same malady. Evidence of a pathological condition in the walnut leaves was also indicated by the escape of necrotic material from the cells and its accumulation in intercellular spaces, coupled with gum formation in these spaces adjoining severely affected cells. There are 24 references.

Symptoms of zinc deficiency in wheat and flax, C. R. MILLIKAN (*Jour. Austral. Inst. Agr. Sci.*, 8 (1942), No. 1, pp. 33-35, figs. 3).—The symptoms are described and illustrated, with the literature briefly reviewed.

Seed and soil treatment for the control of damping-off, L. H. PERSON and S. J. P. CHILTON (*Louisiana Sta. Bul.* 349 (1942), pp. 16).—In a 7-yr. study on the Sharkey and Olivier soils of the State, red copper oxide for seed treatment proved the most practical and effective material tried for controlling damping-off of tomatoes and bell peppers, but that on the seed was not sufficient to control post-emergence damping-off of eggplants. Vasco 4 and zinc oxide gave best results with cabbage, but red copper oxide was toxic. Soil treatments with commercial formaldehyde were about as efficient as red copper oxide seed treatments on tomatoes and bell peppers but were of little value with eggplants. Zinc oxide, Vasco 4, and yellow copper oxide as soil surface treatments were about equally effective against post-emergence damping-off of eggplants. Concentrated formaldehyde solution (40 percent) diluted in five or six times its volume of water was effective against damping-off of tomatoes, peppers, and eggplants but proved toxic to the last named on Olivier soil. Seed treatment of ornamentals by yellow copper oxide was most efficient, followed in order by red copper oxide, Vasco 4, and zinc oxide. The organic mercury dusts were often toxic when applied full strength. Specific recommendations for various crop and ornamental plants are given.

Use of fungicides in war-time, W. B. TISDALE. (Fla. Expt. Sta.). (*Citrus Indus.*, 23 (1942), No. 7, pp. 13, 18).

Diseases of British grasses and herbage legumes, K. SAMPSON and J. H. WESTERN (*Cambridge, Eng.: Univ. Press*, 1941, pp. VII+85, pls. 8, figs. 15).—This handbook includes sections on the diseases of grasses, turf, and herbage legumes, with a short account of mineral deficiencies. A host-parasite index and bibliography of over 13 pages are provided.

Sterilization technique for grass seeds, R. B. STEPHENSON. (Univ. Ill.). (*Plant Physiol.*, 17 (1942), No. 2, pp. 324-325).—Lettuce, cantaloup, and pea seed were sterilized without injury by soaking for 2 hr. in a saturated solution of Semesan and then passing through a 5 percent solution of bromine water. This procedure, however, was lethal to Kentucky bluegrass seed, as were all tested compounds containing Hg. An adequate sterilization without injury to germination was obtained by pretreatment of the grass seed with alcohol followed by Ca hypochlorite.

Thiuram disulfide for turf and for treating seeds, P. P. PRONE (*New Jersey Stas. Nursery Disease Notes*, 14 (1942), No. 10, pp. 36-39).—In this progress report, very promising results are noted in the control of brown patch (*Corticium solani*) and dollar spot (*Sclerotinia homeocarpa*) on creeping bent grasses by use of thiuram disulfide (T. M. T. D.).

The effect of light and temperature on the viability of urediospores of certain cereal rusts, L. HWANG (*Phytopathology*, 32 (1942), No. 8, pp. 699-711).—At intervals during exposure, germination tests were made of the viability of urediospores of several races of *Puccinia coronata*, *P. graminis tritici*, *P. graminis*

secalis, and *P. rubigo-vera tritici*, which had been evenly distributed on white papers in petri dishes and exposed to direct sunlight and to different temperatures. Other things being equal, as the light intensity increased the loss of viability was more rapid. At moderate temperatures some spores remained viable for about a month at light intensities of 500–1,500 footcandles, but for only 12 days at 1,000–7,000 footcandles. Viability was lost most rapidly at high temperatures, but a few spores germinated after exposure to 60° C. for 15 hr. and 8 percent germinated after exposure to 44° for 60 hr. Urediospores dusted over dry surfaces of plants exposed to direct sunlight survived for at least 4 days and caused infection when moisture was supplied at that time. There were no consistent differences in urediospores produced in the field or in the greenhouse, in full light or in half shade, or in those produced early in the life of the uredium and those produced a week later. There are 22 references.

The influence of storage in contact with certain seed-pickling dusts on the germination of grain, D. C. WARE (*Jour. Austral. Inst. Agr. Sci.*, 8 (1942), No. 1, pp. 22–25).—In the experiments reported, wheat and barley seed grain was stored in closed containers in contact with fungicidal dusts (6 mercurial, 1 S, and 2 Cu dusts). No injury to germinability was noted on barley seed stored with any of the dusts used (the one most damaging to stored wheat not included). The germinability of seed wheat was improved by most of the dusts, but certain ones, and more especially those containing ethyl mercury phosphate, caused a depression at 20° C. storage, amounting in one case to 25 percent.

Studies on black stem of alfalfa caused by *Ascochyta imperfecta*, M. L. PETERSON and L. E. MELCHERS. (*Kans. Expt. Sta. coop. U. S. D. A.*). (*Phytopathology*, 32 (1942), No. 7, pp. 590–597, figs. 3).—Black stem, occurring in Kansas and causing destructive defoliation and discoloration of the alfalfa hay crop, was traced to *A. imperfecta*. It probably overwinters as dormant mycelia and pycnidia in crop residues, from which infection takes place during rains the following spring. The optimum temperature for growth in culture was 21° C., with slight growth at 9° and very little at 33°. Pycnidia were produced at 9°–30°, but were most abundant at 27°. Spore suspension inoculation revealed no relationship between age of alfalfa leaves and severity of infection. *Medicago falcata* and *M. ruthenica* were added to the host range.

A nonpathogenic buff-colored barley smut, W. M. BEVER. (*Idaho Expt. Sta. coop. U. S. D. A.*). (*Phytopathology*, 32 (1942), No. 7, pp. 637–639, fig. 1).—Two heads of a buff-colored smut from an F₁ of *Ustilago hordei* × *U. nigra* were collected from a plant of Nepal (C. I. 595) barley. Except for color, these heads were identical with those containing the usual black chlamydospores of *U. hordei*. The spores were glabrous and hyaline, and the germination was typical of the sporidium-forming smuts. Sporidium fusion in culture revealed two sex groups. However, pathogenicity tests failed to produce smut on susceptible hosts. The factors here governing sex and pathogenicity are thus believed to be different.

The relative effect of environmental and genetic factors on growth types of *Ustilago zeae*, M. F. KERNKAMP. (*Minn. Expt. Sta.*). (*Phytopathology*, 32 (1942), No. 7, pp. 554–567).—It was found that single sporidial lines of corn smut on artificial media may consist entirely of sporidia or of mycelium, or of varying proportions of each. Neither the strictly sporidial nor the strictly mycelial lines were found to be changed appreciably by nutrients, plant extracts, silage extract, manure extract, growth substances, poisons, dyes, O₂ supply, or osmotic concentration of the medium. The intermediate lines produced varying amounts of sporidia or mycelium, depending on the effect of environmental factors, but in general the sporidial type predominated in intermediate lines when conditions favored rapid growth, and the mycelial type predominated when conditions

were unfavorable. Abundant nutrients, particularly sugars, proved especially effective in inducing sporidial growth. In the progeny of a cross between strictly sporidial and strictly mycelial lines, there was clear-cut segregation for growth type. Progenies of crosses between predominantly sporidial intermediate lines yielded mostly sporidial segregates, and vice versa. It proved impossible, however, to cross strictly sporidial lines, since plants inoculated with combinations of such lines failed to become infected and examination of the plants indicated that no mycelium was formed. It would seem, therefore, that some lines have only the genetic factors for sporidial propagation and others only for mycelial growth, and the limits of variability imposed by the genes are very narrow. Most lines, however, have genes that permit either sporidial or mycelial growth, and environmental factors determine which will preponderate.

Insect transmission of wallaby ear disease of maize, A. J. SCHINDLER (*Jour. Austral. Inst. Agr. Sci.*, 8 (1942), No. 1, pp. 35-37, fig. 1).—It is shown that this disease is transmissible by jassids, and *Cicadula bimaculata* is said to be mainly responsible, with *Peregrinus maidis* probably also involved.

Rhizoctonia infection of cotton and symptoms accompanying the disease in plants beyond the seedling stage, D. C. NEAL (U. S. D. A. and La. Expt. Sta.). (*Phytopathology*, 32 (1942), No. 7, pp. 641-642, fig. 1).—Note on injury to older plants.

On the cause of the milo disease, L. E. MELCHERS. (Kans. Expt. Sta.). (*Phytopathology*, 32 (1942), No. 7, pp. 640-641).—According to previous investigations, the cause of the root, crown, and shoot rot, or *Pythium* root rot, of milo, more commonly known as the "milo disease," has been ascribed to *P. arrhenomanes*. In this preliminary report, the author states that his more recent studies indicate that this fungus cannot be the sole causal factor, but that certain other organisms, environmental conditions, or extenuating factors other than those originally studied are also etiologically involved.

Field studies of smut resistance in oats, T. R. STANTON and H. C. MURPHY. (Iowa Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 3, pp. 248-258).—In each case using local smut collections, uniform tests of oats for resistance were conducted over 5 yr. at 9-15 stations each year. The Canadian and Gothland varieties underwent high infection by nearly all smut collections, averaging over 73 and 86 percent, respectively. Comparable percentages for the other check varieties (Richland, Monarch, Black Mesdag, Fulghum, and Applier) ranged from 0.56 to nearly 21 percent. Navarro and Victoria were entirely free from infection throughout. Markton showed an average of 1.68 percent in 1935, but was free in the other years. Bond showed some infection in all years due to its susceptibility to the specialized races attacking Red Rustproof strains. Of the 68 varieties and selections considered as having resistance to smut, 23 were free from infection throughout the tests. In general, the amount of infection for most years was very low for nearly all varieties and strains tested, only 18 exhibiting an average exceeding 1 percent. Of the various groups of selections, that from the cross between Victoria and Richland proved most resistant. The Bond crosses were the most susceptible of any group of resistant selections. There are 15 references.

Potato diseases in Montana and their control, H. E. MORRIS and M. M. AFANASIEV (*Montana Sta. Cir.* 166 (1942), pp. 41, figs. 23).—This handbook describes and illustrates some of the common potato diseases occurring in the State and suggests measures which may be taken to reduce the losses therefrom. Included are diseases due to fungi, bacteria, and viruses, psyllid yellows, and nonparasitic diseases and injuries.

A new form of low-temperature injury in potatoes, M. T. HILBORN and R. BOND (Maine Expt. Sta.). (*Amer. Potato Jour.*, 19 (1942), No. 2, pp. 24-29,

fig. 1).—A so-called "mahogany rot," here named "internal mahogany browning," was found to be caused by long exposure to medium low temperature. Chippewas and Katahdins stored at 32° F. through the winter exhibited the discoloration by March, but no injury appeared in these varieties stored at 38°, or in Green Mountain at 32°. Leaf roll aggravated the injury in Chippewas. Exposure to low temperatures for short periods produced the usual freezing injury in all varieties tested. This injury occasionally exhibited a fluorescence, but it was more bluish than the greenish tinge of internal mahogany browning. Leaf roll accentuated the greenish fluorescence, so that it was indistinguishable from that of bacterial ring rot tubers. Internal mahogany browning may reduce the stand and yield of a field planted with seed stock showing the injury.

A contribution to pathological anatomy of rice plants affected by *Gibberella fujikuroi* (Saw.) Wollenweber, I, Y. NISIKADO and K. KIMURA (*Ber. Ōhara Inst. Landw. Forsch.*, 8 (1941), No. 4, pp. 421-426, pls. 2, figs. 2).—Features of the fungus mycelium and its distribution in the affected rice culm are considered.

Sweet potato pox, R. H. DAINES (*New Jersey Stat. Cir.* 438 (1942), pp. 2).—An informative leaflet.

[Tobacco disease studies and observations at the Tobacco Substation], P. J. ANDERSON (*Connecticut [New Haven] Sta. Bul.* 457 (1942), pp. 248-260, figs. 2).—A brief report of progress is given on downy mildew control, including data on removal of paradichlorobenzene crystals and trials of liquid sprays; delayed frost injury to transplants in June; and a general account on tobacco mosaic (symptoms, extent of damage, the causal virus, spread and overwintering, and control, including resistant varieties).

Study of respiration in healthy and mosaic-infected tobacco plants, V. F. C. GLASSTONE (*Plant Physiol.*, 17 (1942), No. 2, pp. 267-277, figs. 5).—Using the same plants throughout each experiment, with apparatus and methods described, it was found that the respiratory ratio of infected and healthy plants remained at the same level until the disease became systemic. When vein clearing was apparent the respiratory rate of the affected plants rose rapidly, followed by a decrease until in the older plants it became approximately equal to that of the normals by the time mosaic mottling had developed. The percentage increase in respiratory rate was about 50 percent higher than in the corresponding healthy plants. There are 21 references.

An analysis of tobacco mosaic virus for biotin, riboflavin, and pantothenic acid, H. SPRINCE and E. B. SCHOENBACH (*Soc. Expt. Biol. and Med. Proc.*, 49 (1942), No. 3, pp. 415-418).—The authors were unable by methods described to demonstrate the presence of these vitamins in significant amounts in moderately concentrated solutions of purified tobacco mosaic virus.

Liquid crystals of the virus of the tobacco mosaic (*Nicotiana virus 1* Allard), V. L. RISCHKOV and V. A. SMIRNOVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 31 (1941), No. 9, pp. 930-932, figs. 2).—The method and various stages and influences in the development of these crystals, briefly outlined, are said to throw some light on the mechanism of crystalline virus accumulations in diseased cells. An essential role in their genesis is played by the protoplasmic currents, which favor a more regular orientation of virus particles and draw them closer together. The liquid crystals of the virus nucleoproteins, the mesomorphic fibrils formed by these proteins, and the chains of spindle-shaped paracrystals are all similar in chemical composition, as well as in physical and morphological characters, to some essential structural elements of protoplasm. It is therefore deemed likely that they may prove good models for studying the conditions under which paracrystalline structures of the protoplasm are formed.

Specific biological activity of tobacco-mosaic virus as influenced by age of lesion and nitrogen supply, E. L. SPENCER (*Plant Physiol.*, 17 (1942), No. 2, pp. 210-222, figs. 2).—Turkish tobacco plants grown in nutrient sand cultures and about 6 in. tall were inoculated on one of the lower mature leaves, and at intervals the virus was isolated by ultracentrifuge and assayed for biological activity. In the inoculated leaf the virus continued to increase both in amount and in specific biological activity per unit of weight for as long as 20 days after inoculation. Withdrawal of the N supply inhibited the increase in specific activity earlier than it did the increase in virus protein. Confirmation of the finding that virus in young lesions displays only a fraction of its potential biological activity was obtained by comparing virus isolated from the inoculated leaf with that from the more recently invaded top of the plant. Calculations from the rates of sedimentation in the analytical ultracentrifuge indicated that virus preparations from young lesions may contain particles considerably larger than those characteristic of preparations from older lesions. There are 13 references.

The effect of pH on inactivation of tobacco mosaic virus by X-rays, A. MARSHAK and W. N. TAKAHASHI. (Univ. Calif.). (*Natl. Acad. Sci. Proc.*, 28 (1942), No. 5, pp. 211-216, fig. 1).—It is concluded from this study that energy released by an ion pair produced within a virus particle may travel through that particle and inactivate one or more of the elementary virus units contained therein. Electrons reaching the virus from the suspending medium have sufficient energy to inactivate the virus particle. More of the electrons produced by X-rays in the suspending medium reach the virus particles when the particles carry a net positive charge than when it is negative, and the greater the net positive charge the more electrons will be attracted.

The broad ring-spot virus, J. JOHNSON and R. W. FULTON. (Wis. Expt. Sta. and U. S. D. A.). (*Phytopathology*, 32 (1942), No. 7, pp. 605-612, figs. 2).—A new virus found on tobacco in the field is described and given the common name "broad ring-spot" to distinguish it from other viruses inducing similar types of symptoms. It is transmissible to several other plant families, and its thermal death point is 54° C., maximum longevity in vitro about 42 hr., and dilution end point slightly above 1 in 1,000. It was apparently not filterable by ordinary methods, and was not transmitted by the common peach aphid (*Myzus persicae*). The properties and other characteristics are sufficient to distinguish this virus from certain others with which it was compared. Although too rare to be of practical significance, it is of some special interest to those working on problems relating to the origin and distribution of viruses in nature.

Changes in the metabolism of wheat leaves induced by infection with powdery mildew, P. J. ALLEN. (Univ. Calif.). (*Amer. Jour. Bot.*, 29 (1942), No. 6, pp. 425-435, figs. 20).—In lightly infected leaves the respiration curve was found to exhibit two maxima corresponding, respectively, to the time of maturity of the primary and of the secondary colonies. The maximum in winter-grown greenhouse plants was only about one-third that of plants grown under better lighting. Growth of a mildew colony is rapid during the period of increasing respiration, sugar, and starch, but after these reach their peak it slows down. Individual colonies on heavily infected plants, where the respiratory maximum occurs a week after inoculation, are therefore smaller than those on lightly infected ones, where respiration is not at its height for about 2 weeks. The substrate oxidized in lightly infected leaves is mainly carbohydrate, and also in the heavily infected ones up to the respiratory maximum, but thereafter other substances are also oxidized. Mildew infection leads to a break-down of the photosynthetic mechanism which involves both the light and dark reactions, and details are discussed. In heavily infected plants there is an accumulation of

soluble sugars reaching a maximum simultaneously with respiration. In infected leaves starch is deposited near the mildew colonies, being most abundant at the maxima of respiration and soluble sugars and disappearing as they decrease. During the early growth of the fungus chlorotic spots appear beneath each colony and spread outward until they fuse. Before the fusion is completed and at about the time of the respiratory maximum, chlorophyll is re-formed under the center of each colony and spreads outward to form green islands, each of which is about the size of a mildew colony. An estimate of the excess of carbohydrate produced over the amount utilized by the leaf showed that the quantity available for export decreases to zero or below at the time of the respiratory maximum, and thereafter all that is synthesized is utilized by the leaf itself. There are 27 references.

Controlling plant diseases in the home garden, C. M. TUCKER (*Missouri Sta. Cir.* 238 (1942), pp. 8).—An informative leaflet.

Vegetable disease problems on Long Island, H. S. CUNNINGHAM (*Farm Res. [New York State Sta.]*, 8 (1942), No. 3, pp. 14, 15, figs. 2).—This is a general discussion of the relations of climate, soil conditions, and intensive production to the incidence and effects of diseases, with particular reference to potatoes, crucifers, and sweet corn.

Bacterial blight of beans, C. M. HAENSELER (*New Jersey Stas. Cir.* 432 (1942), pp. 2).—An informative leaflet.

Club root of cabbage and related plants, C. M. HAENSELER (*New Jersey Stas. Cir.* 430 (1942), pp. 2).—An informative leaflet.

Sweet corn wilt and smut tests, 1941, C. M. HAENSELER (*New Jersey Stas. Plant Disease Notes*, 19 (1942), No. 12, pp. 45-47+[2]).—The reaction of 54 different lots of yellow sweet corn (about 100 stalks to the lot) as tested in the plant pathology plot are discussed and tabulated.

Find five fungi chiefly to blame for pea root-rot, O. A. REINKING (*Farm Res. [New York State Sta.]*, 8 (1942), No. 3, p. 13).—Field surveys and laboratory tests have thrown light on the distribution and relative importance of the organisms causing this trouble. In this preliminary note a few practical points of general interest to pea growers are briefly presented, with emphasis on the value of crop rotation, proper fertilization, and seed treatment.

El matizado del pimientito en Puerto Rico [Mosaic of pimientito in Puerto Rico], J. ADSUAR (*Agr. Expt. [Puerto Rico Univ. Sta.]*, 2 (1942), No. 2, pp. 7-8, fig. 1).—This note concerns a mosaic-type virus disease of pimientito pepper on the Island and its control by resistant varieties.

Fusarium wilt of tomato, C. M. HAENSELER (*New Jersey Stas. Cir.* 431 (1942), pp. 2).—An informative leaflet.

Stickers and spreaders in orchard sprays, G. L. MACK and J. M. HAMILTON (*Farm Res. [New York State Sta.]*, 8 (1942), No. 3, p. 2, fig. 1).—With the recommended reductions in the amount of spray mixtures in order to conserve scarce materials, better coverage is a prime requisite. Stickers and spreaders are important in attaining this end, and this note evaluates their role and discusses their use.

How shall we spray and control pin point scab, D. CATION (*Mich. State Hort. Soc. Ann. Rpt.*, 70 (1940), pp. 84-88).—An address summarizing experimental data on the factors influencing such late apple scab infections and the best spray procedures for preventing it.

Arsenical injury and its control, E. J. RASMUSSEN (*Mich. State Hort. Soc. Ann. Rpt.*, 70 (1940), pp. 22-25).—The author briefly discusses the symptoms and factors influencing arsenical injury to apples and the experimental results of 1940 in Michigan, from which it was found that premature defoliation through use of lead arsenate on susceptible varieties could be almost entirely

prevented by adding a 1-4-100 or 2-4-100 ZnSO₄ lime mixture to all applications made 2 weeks after the calyx spray. Among the detailed recommendations, avoidance of indiscriminate use of lead arsenate is suggested.

Brown-rot control on peaches and other stone fruits, D. CATION (*Mich. State Hort. Soc. Ann. Rpt.*, 70 (1940), pp. 103-104).—Brief recommendations based on 1940 experiments.

Apothecia of *Sclerotinia fruticola* on peach in western Washington, G. A. HUBER and K. BAUR. (West. Wash. Expt. Sta.). (*Phytopathology*, 32 (1942), No. 7, pp. 635-636, fig. 1).—The apothecia were found developing from peach mummies in Washington during the spring of 1941. This is believed to be the first report for the State.

Peach yellows and little peach, T. F. MANNS (*Delaware Sta. Bul.* 236 (1942), pp. 50, figs. 15).—The author briefly outlines the investigations and status of these two diseases prior to 1915 and summarizes his own studies beginning in 1915 and extending through 1941, with 33 references to the more recent literature. Both virus diseases are spread by the plum leafhopper (*Macropsis trimaculata*), which breeds abundantly in Delaware on all plum varieties, both wild and cultivated, and also on neglected peach and apricot, but has not been found on cherries. Some plum varieties mask these diseases, the Myrobalan plum (*Prunus cerasifera*), chief foundation rootstock for budding to cultivated plums, being one of these symptomless carriers. Certain oriental plums (*P. salicina*) may carry these diseases and live for years. They are also hosts of large numbers of plum leafhoppers, one such tree carrying over 12,000 vectors. In well-sprayed peach orchards this insect was difficult to find. In the station variety plum orchard, 19 of 52 plums 28 yr. old, when budded onto peach, were shown to be little peach carriers and 9 were carrying yellows. Epidemics of both diseases on the station farm have been related to the variety plum orchard. Control in commercial peach orchards involves removal of all plums within about a mile, as well as all infected peach trees. The facts established by this series of researches are briefly summarized, and an appendix characterizes 9 virus diseases of peaches.

Banded chlorosis, a transmissible disease of cherry, S. M. ZELLER and J. A. MILBETH. (Oreg. Expt. Sta.). (*Phytopathology*, 32 (1942), No. 7, pp. 634-635, fig. 1).—The new virus disease described from Japanese flowering cherry (*Prunus serrulata*) proved transmissible by budding whether or not the buds "took." It was transmitted also to mazzard stock. The virus is named *Marmor pallidolimbatus* and *Prunus virus 10*.

Trade role in control of cherry yellows, E. M. HILDEBRAND. (Cornell Univ.). (*Amer. Nurseryman*, 75 (1942), No. 8, pp. 9-10).

Failure to inactivate the false blossom virus in dormant cranberry vines by heat, N. E. STEVENS (*Cranberries*, 7 (1942), No. 1, p. 8).—In the tests reported, temperatures high enough to inactivate the virus killed or hopelessly stunted the plants. No difference was noted in the heat resistance of dormant, healthy, and diseased vines.

Strawberry leaf roll, a new disease, G. H. BECKLEY and A. G. PLAKIDAS. (La. Expt. Sta. et al.). (*Phytopathology*, 32 (1942), No. 7, pp. 631-633, fig. 1).—An apparently new strawberry disease found in Canada and New York State is described and named "strawberry leaf roll," pronounced downward rolling of the leaflets being its most characteristic symptom. Its transmission by runner grafting seems to indicate its virus nature.

Mould control in grapes: Results obtained with the use of sulphur dioxide, I. DONEN (*Farming in So. Africa*, 17 (1942), No. 192, pp. 199-208, figs. 3).—Testing about 500 boxes of grapes, of which 300 were treated with SO₂, the results

are said to indicate the gas treatment a very promising method of increasing the selling life of nonrefrigerated fruit sent to African markets.

Olive anthracnose in the United States, R. E. PONTIS and H. N. HANSEN. (Univ. Calif. et al.). (*Phytopathology*, 32 (1942), No. 7, pp. 642-644, fig. 1).—This disease was found on Mission variety fruits in December 1941 at Berkeley, Calif. *Gloeosporium olivarum* was identified as the cause, inoculations producing symptoms after 36 hr. This is said to be the first report of the fungus for the United States.

Swollen shoot and die-back of cacao, O. J. VOELCKER and J. WEST (*Trop. Agr. [Trinidad]*, 19 (1942), No. 5, p. 83).—The chief characteristics distinguishing this disease from ordinary forms of dieback are emphasized.

Prevention of brown rot, H. S. FAWCETT and L. J. KLOTZ. (Calif. Citrus Expt. Sta.). (*Calif. Citrog.*, 27 (1942), No. 6, p. 156).—Proper planting and fungicidal procedures as aids in avoiding a large amount of brown rot gummosis are summarized.

Gegevens, verkregen bij het onderzoek naar de waardplanten van *Tylenchus coffeae* [Investigation of the host plants of *T. coffeae*], H. J. DE FLUITER and J. J. MULHOLLAND (*Bergcultures*, 15 (1941), No. 47, pp. 1588-1593).

Duration of effect [of] zinc sulphate treatments on large, badly rosetted pecan trees, A. C. GOSSARD and H. E. PARSON. (U. S. D. A.). (*Peanut Jour. and Nut World*, 20 (1941), No. 9, pp. 13-14, 25).—This is a summary of trials with soil application and injection of ZnSO₄ for controlling rosette in mature pecan trees, begun in 1933-34 but without further treatments, and with records kept through 1940. Differences between treated and control trees, in favor of the former, were greatest in 1935-36, and the general indication was that the corrective effect of Zn tended to decrease slightly after 4-5 yr.

Pythium disease of fibrous-rooted begonia and its control, J. T. MIDDLETON, C. M. TUCKER, and C. M. TOMPKINS. (Calif. and Mo. Expt. Stas. et al.). (*Jour. Agr. Res. [U. S.]*, 65 (1942), No. 2, pp. 89-95, figs. 2).—The authors describe a destructive crown and stem disease of *Begonia semperflorens*, prevalent in California and Missouri. The symptoms consist of a watery rotting of crown, stem, petiole, and leaf tissues. When stems become infected several inches above the soil line the plants eventually collapse. The roots are usually not attacked. In California the disease is caused by *Pythium ultimum* and in Missouri by *P. debaryanum*, *P. splendens*, and *P. ultimum*, all proving pathogenic on inoculation. The cardinal temperature points of the fungi are for *P. debaryanum* 4°, 28°-31°, and 37° C.; for *P. splendens* 10°, 28°-31°, and 34°; and for *P. ultimum* 4°, 25°-28°, and 37°. Overcrowding, excessive watering, and relatively high temperatures are predisposing factors. The disease may be controlled in the greenhouse by using steam-sterilized flats and soil. For outdoor plantings an immune variety is available.

Stem canker of camellia, B. H. DAVIS and P. P. PIBONE (*New Jersey Stas. Nursery Disease Notes*, 14 (1942), No. 9, pp. 32-35).—The symptoms of a stem canker under study for the past 2 yr. and found due to *Glomerella cingulata* are described. In cross-inoculations, isolates from camellia and apple failed to infect twigs of the reverse hosts, but apple fruits and camellia leaves were attacked. General suggestions as to control are given.

Verticillium wilt of chrysanthemums and its control, P. E. TILFORD and H. A. RUNNELS (*Ohio Sta. Bul.* 630 (1942), pp. [1]+23, figs. 5).—This serious and widespread disease occurs to some extent in most greenhouses where chrysanthemums are grown, and many otherwise excellent varieties have been discarded by florists because of susceptibility. Distinct wilting occurs in some varieties, whereas in others no wilting is evident. Affected plants are stunted

and their leaves die from the base up the stem. The symptoms become increasingly severe and are most evident during blooming, but the plants are seldom killed. As it occurs in Ohio, the disease is due to *V. dahliae*, a common soil fungus infecting many plant species. It enters chrysanthemum plants through the roots, invading the xylem of roots, stems, and leaves. It is disseminated by infested soil and by cuttings from diseased plants. Control is effected by soil sterilization and use of cuttings from healthy plants. Plants for propagation should be selected in the fall before the blooms are cut, forced into rapid growth in late winter and spring, and tip cuttings made from the most vigorous shoots. Only resistant varieties should be grown unless the soil can be sterilized. Steam sterilization of the soil is said to be more satisfactory than by formaldehyde or chloropicrin, but where not feasible the chemical methods may be used.

Control of Fusarium yellows of gladiolus by resistance, R. NELSON. (Mich. Expt. Sta.). (*Gladiolus Sup.* [New England Gladiolus Soc.], 6 (1942), No. 2, pp. 4-9).—This is a brief summary of work by the station (1935-41) in controlling this important gladiolus disease, with lists of susceptible and resistant varieties.

Stem and stolon canker of Pachysandra, P. P. PIBONE (*New Jersey Stas. Nursery Disease Notes*, 14 (1942), No. 11, pp. 40-43).—Proof is presented of the pathogenicity of a large-spored species of *Volutella* in causing stem and stolon canker, said to be the most destructive fungus infection of *P. terminalis*. The history and symptoms of the disease are given, and control suggestions are made.

Bud blast of peony, P. P. PIBONE and O. W. DAVIDSON (*New Jersey Stas. Nursery Disease Notes*, 14 (1942), No. 12, pp. 44-47).—Observations and isolation trials have reopened the question as to the cause of the bud blast of peony hitherto ascribed to *Botrytis* spp., and the possibility of other factors (nematodes, weather, nutrition) being involved in cases showing symptoms atypical of *Botrytis* infection is suggested.

The snapdragon rust, W. C. BLASDALE (*Jour. Calif. Hort. Soc.*, 3 (1942), No. 3, pp. 126-129).—A general discussion of this rust disease, its history, cause (*Puccinia antirrhini*), hosts, and control by the development of resistant varieties, particularly through work by the California Experiment Station and seed growers of the State.

The production of sporidia of Cronartium ribicola on cultivated red currants in relation to infection of white pine, W. H. SNELL (*Amer. Jour. Bot.*, 29 (1942), No. 7, pp. 506-513).—From a considerable body of data on number of leaves, total leaf area, and numbers of telia and sporidia per bush for cultivated red and European black currants and for wild gooseberries, it is shown that a garden row of red currants will produce only a fraction of the number produced by black currants. Several factors in reducing the total sporidium production on red currants are discussed, viz, the smaller number of bushes in a row or patch that become infected, the high resistance of mature leaves, the tendency to produce a single set of leaves per season, lower viability of teliospores and sporidia, early defoliation, necrosis of blister rust spots, and reduced size of telia. By use of the "threshold" or "quantum" principle, which derives a certain theoretical volume of sporidia for producing a single canker on pine, it is shown that maximum sporidium production of red currants in New York is at least very close to, if it may not be far below, the lowest limits necessary to infect pine, especially for severe infection, unless possibly under unusually favorable circumstances. This study is believed to indicate definitely that red currants cannot be considered very dangerous to white pine, if at all so, and that the necessity of applying the 900-ft. eradica-

tion zone to them in gardens should be conclusively demonstrated. There are 21 references.

Hormodendrum resinae (Lindau), an inhabitant of wood impregnated with creosote and coal tar, C. M. CHRISTENSEN, F. H. KAUFERT, H. SCHMITZ, and J. L. ALLISON. (Minn. Expt. Sta.). (*Amer. Jour. Bot.*, 29 (1942), No. 7, pp. 552-558, figs. 2).—A fungus tentatively identified as *H. resinae* was isolated from various creosoted wood products collected over a wide area of the United States, and it appears to be a universal inhabitant of creosote and coal tar treated wood in service. It is deemed not unlikely that this fungus is a common saprophyte in soil, untreated wood, or plant refuse, since it was unable to survive well in competition with common molds. Resinous bark and wood possibly formed the original source of inoculum, though other sources may exist. *H. resinae* not only tolerates a far higher concentration of creosote and coal tar than other known fungi but can grow and reproduce with no other source of nutriment, apparently being able to metabolize some of the components of these materials. The fungus proved no more resistant to inorganic toxicants than a number of other fungi. It appears to have no effect on the strength of the wood it infects. An unidentified bacterium was also isolated from a large majority of the creosoted wood samples investigated.

The transient feeding of root-knot nematode larvae, M. B. LINFORD. (Univ. Hawaii.) (*Phytopathology*, 32 (1942), No. 7, pp. 580-589, figs. 3).—*Heterodera marioni* larvae begin feeding on the root surface and continue as they enter into and migrate within the root. They insert the tip of the stylet into a cell with some difficulty, lie at rest a few seconds, then suck out part of the cell substance without killing the cell. A few cells at the point of entry and occasionally elsewhere are disrupted by the migrating nematodes. Larvae attacking in groups destroy many cells, causing holes, cracks, or (in extremely heavy infestation) disintegration of the root tips. This feeding during entry and migration apparently explains the prompt interruption of root elongation, the swelling of root tips, and the early hypertrophy of some cells remote from the site of permanent feeding.

Chloropicrin and ethylene dichloride for root-knot nematode control, A. G. NEWHALL and F. L. STARK, JR. (Cornell Univ.) (*Phytopathology*, 32 (1942), No. 7, pp. 626-630, figs. 2).—The effectiveness of chloropicrin and ethylene dichloride, separately or in mixture, as soil fumigants for controlling *Heterodera marioni* was compared, and a simple statistical method (described) of evaluating volatile soil fumigants was used. Excellent control in a greenhouse sandy soil was obtained on a spring tomato crop by soil treatments the previous September, using (1) chloropicrin at 10.5 lb. per 1,000 sq. ft. (460 lb. per acre) applied at 10-in. intervals, at 2 cc. per injection, 4-5 in. deep, and (2) a mixture of chloropicrin and ethylene dichloride, 1-9, at 10 cc. per injection (230 lb. chloropicrin plus 1,594 lb. ethylene dichloride per acre). Less effective control was obtained by 15 cc. injections of straight ethylene dichloride, 2,656 lb. per acre. At the advanced 1941 price of 12 ct. per pound this is not recommended either alone or in mixture, but at sufficiently lower prices its use as a substitute for half of the chloropicrin may be considered as an economy measure.

ECONOMIC ZOOLOGY—ENTOMOLOGY

[Investigations in economic zoology and entomology by the Arizona Station] (*Arizona Sta. Rpt. 1941*, pp. 45-46, 54-56).—A progress report (E. S. R., 85, p. 641) noting research on forage requirements of range vegetation by jack rabbits, scale insects, and the biology and control of the cotton pest *Oreontiades femoralis* Van D.

[Investigations in economic zoology and entomology by the Massachusetts Station] (*Massachusetts Sta. Bul.* 388 (1942), pp. 37-38, 50-52, 54-55, 57-66, 74, figs. 3).—A progress report (E. S. R., 85, p. 786) by H. J. Franklin, A. I. Bourne, W. D. Whitcomb, W. Garland, W. E. Tomlinson, Jr., W. B. Becker, A. S. Levine, C. R. Fellers, and J. Lubitz which notes as insects affecting the cranberry, the hill fireworm *Thiascula finitella* Walk. and the cranberry root grub *Amphitoma vulpina*, the control of the cranberry fruitworm, gypsy moth, cranberry girdler, and black-headed fireworm, and the prevalence of cranberry pests; oil sprays for dormant applications and summer treatments for control of European red mite; control of the cabbage maggot, squash vine borer, and onion thrips; the spray residue problem; apple maggot control; insecticides for control of the European corn borer; potato spraying experiments; introduction of parasites of oriental fruit moth in peach orchards; naphthalene and similar compounds as greenhouse fumigants; control of the common red spider on greenhouse plants; biology and control of the apple leaf curling midge; control of plum curculio in apples; biology and control of the grape plume moth and grape cane girdler; insects and Dutch elm disease; and red squill research.

Rodent pests of Iowa and their control, H. GUNDERSON and G. C. DECKER (*Iowa Sta. Bul.* P43, n. ser. (1942), pp. 421-436, figs. 8).—A practical account of the important rodent forms met with in the State and means for their control.

Uses and management of ponds and lakes, H. S. TELFORD and O. A. STEVENS (*North Dakota Sta. Bul.* 313 (1942), pp. 40, figs. 15).—Following a brief foreword by H. L. Walster, the director, part 1 of this bulletin (pp. 3-14) deals with the value of ponds to the farm and community, including particularly their many uses, i. e., for livestock, fish, waterfowl, songbirds, muskrats, and recreation; and part 2 (pp. 14-34) presents the results of a survey of 19 lakes and ponds in the State, including their chemical and physical properties and the beneficial and injurious occupants. A list of selected references to the literature and tables reporting the physical and chemical properties of the water and the kinds and abundance of species are included.

The grey field slug *Agriolimax agrestis* L. and its environment, R. CARRICK (*Ann. Appl. Biol.*, 29 (1942), No. 1, pp. 43-55, figs. 4).—A study of the physical environment of *A. agrestis* in the laboratory is reported upon, the results having been correlated with conditions in the field with particular reference to the occurrence of outbreaks on the potato crop in the Lothians of Scotland. "The slug tolerates a wide range of soil pH. Soils of high water-holding capacity sustain the densest populations of slugs, and they must be 40-80 percent saturated before oviposition followed by development of the eggs can occur. The maximum lethal temperature is about 35° C. The zone of effective temperatures extends from just above freezing point to 25°, and there is a high degree of resistance to freezing. Oviposition occurs anywhere between 3° and 20°. Time of development of the egg varies from 105 days at 5° to 18 days at 20° and mortality of the egg increases from 0 at 5° to 37 percent at 20°. Hatching of the egg is inhibited below 5°. Temperature exercises a direct controlling effect on development. Normal extremes of weather in Britain are not usually lethal to *A. agrestis*, but they do serve to inhibit adult activity and reproduction. In winter, manuring of the fields tends to counteract the lethal effect of adverse weather, and rainfall in late summer is important in determining the extent of damage by slugs to potato tubers during autumn."

Baiting slugs using metaldehyde mixed with various substances, H. F. JARNES and J. W. WEIL (*Ann. Appl. Biol.*, 29 (1942), No. 1, pp. 56-68, figs. 6).—Following a brief review of the literature concerning mixtures of other substances

with metaldehyde for use as slug baits, an account is given of the comparison of the numbers caught by 44 substances and by bran in metaldehyde baits. It is shown that baits containing feeding stuffs are undoubtedly better than baits of metaldehyde alone or metaldehyde mixed with nonfeeding stuffs, such as soil, sand, etc. Nutritive feeding stuffs, such as cakes and meals, are better as a group than roughage feeding stuffs, such as bran. The efficiency of metaldehyde baits is discussed. The range of effectiveness of the baits, the proportion of slugs visiting the baits dying, the speed of annihilating a slug population, the most economical strength of metaldehyde to use, as well as the mixing of the baits and their distribution are points which need further investigation. Meanwhile, it is suggested that it is worth while using small quantities of a feeding stuff in order to save much larger quantities of crops which are themselves feeding stuffs. A large slug population can be greatly reduced by a single application of metaldehyde plus a feeding stuff and can be subsequently prevented by the use of metaldehyde and an inert or nonfeeding stuff diluent from reaching undue proportions again.

The maintenance of high atmospheric humidities for entomological work with glycerol-water mixtures, C. G. JOHNSON (*Ann. Appl. Biol.*, 27 (1940), No. 2, pp. 295-299, figs. 2).

The relation of unfreezable water to cold-hardiness of insects, L. P. DITTMAN, G. B. VOET, and D. R. SMITH. (Md. Expt. Sta.) (*Jour. Econ. Ent.*, 35 (1942), No. 2, pp. 265-272, figs. 7).—Determinations made of unfreezable water at various subzero temperatures from above to below the undercooling range in overwintering European corn borer, codling moth, southern cornstalk borer, corn earworm, and squash bug and on summer forms of European corn borer, corn earworm, squash bug, and Mexican bean beetle have shown maximum freezing to take place as soon as the undercooling points were reached. When insect samples were frozen to temperatures below their undercooling range there was remarkable uniformity in the percentage of unfreezable water in all species studied, and complete freezing of body water did not occur at temperatures as low as -40° C. (-40° F.). There was no relation of either the percentage of total water unfreezable or the unfreezable water-dry weight ratio to cold hardiness when the insects were frozen below the undercooling temperature.

[Notes on economic insects and their control] (*Jour. Econ. Ent.*, 35 (1942), No. 2, pp. 264, 281-291, figs. 3).—Contributions presented (E. S. R., 87, p. 247) are: The Effect of Parasites and Predators on Corn Earworms in Sumac Sargo Heads, by J. R. Quinby and J. C. Gaines (p. 284) (Tex. Expt. Sta.); Woolly Apple Aphid Infesting Apple Cores, by E. O. Essig (p. 281), and A Convenient Cage for Confining Insects to Plants, by J. T. Medler (pp. 283-284) (both Univ. Calif.); Thiocyanate-Derris Dusts for Control of Truck Crop Insects, by H. G. Walker and L. D. Anderson (pp. 281-282) (Va. Truck Sta.); A Simple Method of Obtaining Standardized Houseflies, by P. De Bach (pp. 282-283), and The Deposition of Non-viable Eggs by Hymenoptera (p. 283) and The Introduction of *Phycus testaceus* Masi Into California (pp. 290-291), both by S. E. Flanders (all Calif. Citrus Sta.); Field Studies of Codling Moth Larvae Attractants, by C. W. Wingo and H. E. Brown (pp. 284-285) (Univ. Mo.); Insecticides Derived From Plants, by N. E. McIndoo (pp. 285-286), Effect of Bentonite and of Hydrated Lime on the Toxicity of Phenothiazine to Codling Moth Larvae, by E. H. Siegler and L. E. Smith (pp. 286-287), What is London Purple? by R. C. Roark (pp. 287-288), and A Pyrethrum-Sesame Oil Aerosol Used Against Cheese Skipper Adults, by S. C. Billings, L. D. Goodhue, and W. N. Sullivan (pp. 289-290) (all U. S. D. A.); A Method of Locating Insect Eggs in Plant Tissues, by W. E. Curtis (p. 286) (Cornell Univ.); Two Species of Black Carpet Beetle, by W. and M. B. Moore (p.

288); Volatile Fluorine Compounds for the Control of Insects, by S. Marcovitch (pp. 288-289) (Univ. Tenn.); A Destructive European Insect [*Amphimallus majalis* Razoum (*rufescens* Latr.)] New to the United States, by F. L. Gambrell, S. C. Mendall, and E. H. Smith (p. 289) (N. Y. State Sta.); and The Oviposition Habits of *Feltia subgothica* Haworth, by W. V. Balduf (p. 290) (Univ. Ill.).

[Insect investigations by the New Haven Station]. (Partly coop. U. S. D. A.). (*Connecticut [New Haven] Sta. Bul.* 452 (1942), pp. 9-12, 12-13).—A progress report (E. S. R., 86, p. 65) noting studies by R. B. Friend et al. on the European corn borer, squash vine borer, oriental fruit moth, European red mite, insecticides for orchard use, Japanese beetle, gypsy moth, European pine shoot moth, white pine weevil, grassland insect investigations, and settling rates of diluents in dusts.

Insect investigations during 1941, A. W. MORRILL, JR., and D. S. LACROIX. (Coop. U. S. D. A.). (*Connecticut [New Haven] Sta. Bul.* 457 (1942), pp. 260-266, fig. 1).—A progress report (E. S. R., 85, p. 786) noting work with the potato flea beetle, tobacco thrips, and wireworm control, as well as mention of the more abundant insects during 1941.

[Entomological studies by the Florida Station] (*Florida Sta. Rpt.* 1941, pp. 71, 72-75, 149-153, 161-162, 165-166, fig. 1).—Progress (E. S. R., 85, p. 641) at the main station discussed included work with the Florida flower thrips, introduction and propagation of beneficial insects, onion thrips, and the pepper weevil, all by J. R. Watson; the larger plant bugs, by H. E. Bratley; control of fruit and nut crop insects, by Watson, S. O. Hill, and Bratley; the gladiolus thrips, by Watson and J. W. Wilson; biology and control of Florida aphids, by A. N. Tissot; and life history, food preferences, ecological distribution, and control of the eastern lubber grasshopper, by Watson and Bratley. Work at the Citrus Substation included control of the purple scale and the combined control of scale insects and mites on citrus, both by W. L. Thompson, and at the Everglades Substation research with wireworms, the bean leafhopper, bean leaf roller, and the prevalence and control of the sugarcane borer, all by Wilson.

[Entomological investigations by the Kentucky Station] (*Kentucky Sta. Rpt.* 1941, pp. 18-19, 25-26, 30, 32-35).—A progress report (E. S. R., 85, p. 786) noting the effect of the meadow plant bug on bluegrass seed setting; control of poultry lice, corn earworm, fruitworm, green June beetle grubs in bluegrass and in tobacco beds, and of white grubs in bluegrass sod; tests of oil-nicotine spray for insects; May beetle control; and methyl bromide fumigation for control of the strawberry crown borer.

[Entomological investigations by the Wyoming Station]. (Coop. U. S. D. A.). (*Wyoming Sta. Rpt.* 1941, pp. 13-16).—A progress report (E. S. R., 85, p. 91) noting work by Pfadt, [C. H.] Gilbert, and A. P. Sturtevant on range grasshoppers and on bee culture, including resistance of bees to disease.

Entomological investigations (*Austral. Council Sci. and Indus. Res. Ann. Rpt.*, 15 (1940-41), pp. 17-27).—Investigational work of the year with insects of importance, particularly as crop pests, their occurrence and control, is reported.

Cotton insect investigations in Peru, F. F. BIBBY (*Jour. Econ. Ent.*, 35 (1942), No. 2, pp. 193-197, figs. 3).—A study of cotton insects made in Peru from September 1938 to March 1939, inclusive, primarily of the control of the cotton aphid and of thrips, largely *Leucothrips piercei* Morg., which are serious pests of cotton in that country, is reported upon.

Some natural enemies of stored-tobacco insects, with biological notes, C. O. BARE. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 2, pp. 185-189).—In the course of collections and observations on the biology, made during the fall of 1939 and in 1940, of the enemies of the cigarette beetle and the tobacco moth in tobacco warehouses of Virginia and North Carolina, 3 species of para-

sites and 3 predators of the cigarette beetle and 3 parasites and 11 predators of the tobacco moth were found. The most important parasites were *Aplastomorpha calandrar* (How.) on cigarette beetle larvae and pupae and *Microbracon hebetor* (Say) on tobacco moth larvae. The predators, with the possible exception of the mites, were of only incidental importance. *Monieziella* mites on the cigarette beetle and *Seiulus* and *Cheyletus* mites on the tobacco moth were important natural enemies. None of the species was observed to bring about a large degree of reduction in the numbers of their hosts.

Control of insects attacking stored tobacco and tobacco products, W. D. REED and J. P. VINZANT (*U. S. Dept. Agr. Cir. 635* (1942), pp. 40, figs. 23).—The tobacco industry suffers heavy losses from infestations of the tobacco moth and the cigarette beetle. The cigarette beetle is cosmopolitan in distribution and a destructive pest of cured and manufactured tobacco throughout the world. In Virginia and North Carolina the overwintered larvae start pupating in April, and the spring brood of beetles start emergence about May 15. Most individuals of a generation complete development in from 50 to 60 days, although there is an overlapping of generations. In southern climates and heated factories breeding may be continuous throughout the year. The tobacco moth was first recorded as a pest of stored tobacco in Europe in 1909, and infestations are largely confined to flue-cured and imported types of cigarette tobacco. Winter is passed in the larval stage and pupation begins in March. During warm weather the egg-to-adult period of moths is about 60 days. Infestations originate on the farm before tobacco is sold or in the storage or factory after the tobacco is redried and packed. Control of the insects in open-type warehouses consists of the use of insect traps, weekly applications of pyrethrum powder, and screening of warehouses. In closed-type warehouses control may be effected by periodic fumigations with hydrocyanic acid at dosages of 10 and 16 oz. per 1,000 cu. ft. with an exposure of 72 hr. Control in chamber fumigations at atmospheric pressure and reduced pressures includes the use of liquid hydrocyanic acid, sodium cyanide and sulfuric acid, calcium cyanide, carbon disulfide, a mixture of ethylene oxide and carbon dioxide, and a mixture of methyl formate and carbon dioxide.

A list of unimportant species of insects found in stored tobacco and the parasites of the tobacco moth and cigarette beetle is given. A program of insect control for the industry is discussed, figures on the cost are given, and safeguards to be employed in handling the fumigants are emphasized.

Fumigation of open-type tobacco warehouses, J. N. TENHET and W. D. REED. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 2, pp. 190–193, figs. 3).—Progress has recently been made in the fumigation of tobacco stored in the open-type tobacco warehouses through the use of rubberized canvas curtains to cover the open spaces along the walls. This material was practically gasproof, and the open warehouses were temporarily closed for effective fumigation. The curtains were each 77 by 12 ft. and two covered one outer wall. The total cost of each, including grommets, rings, and tie ropes, was \$55 and the cost per warehouse \$220. Mortality tests were made with lots of cigarette beetles and tobacco moths placed in the warehouses during the fumigation, and catches of insects were made in suction light traps. Dosages of 6 oz. and 12 oz. of hydrocyanic acid gas were applied with exposures of 48 and 50 hr. under conditions of summer temperatures. The most satisfactory results were obtained with a 12-oz. dosage and a 50-hr. exposure at 87° F. at the start of the fumigation.

Insects and other pests of Florida vegetables, J. R. WATSON and A. N. TISSOT (*Florida Sta. Bul. 370* (1942), pp. 118, figs. 63).—This is a revision and enlargement of Bulletin 232 (E. S. R., 66, p. 551).

Los insectos dañinos en las hortalizas [Insects destructive to vegetables], F. SKIN, JR. (*Agr. Hopt. (Puerto Rico Univ. Sta.)*, 2 (1942), No. 2, pp. 2-5, figs. 3).—A practical account.

Mushroom insects: Their biology and control, C. A. THOMAS (*Pennsylvania Sta. Bul.* 419 (1942), pp. [4]+43, figs. 43).—This publication includes descriptions, biologies, injuries, and control measures for fungus gnats (sciarids), manure flies (phorids), gall gnats (cecid flies), springtails, mushroom mites, and minor pests, including sowbugs, slugs, looper caterpillars, nematodes, rats and mice, wireworms, beetles, and chironomid flies. Control measures discussed are high temperatures—natural fermentation of manure, low temperatures, fumigation during heating of manure and during growth of crop, dusts and dusting, sprays, and light traps. An extensive bibliography is included.

[Contributions on fruit insects control] (*Mass. Fruit Growers' Assoc. Rpt.*, 47 (1941), pp. 20-22, 120-132).—Contributions presented at the 1941 meeting of the association include Orchard Insects in 1940, by W. D. Whitcomb and A. I. Bourne (pp. 20-22), Insect Pests of 1940 and What to Expect in 1941, by A. I. Bourne (pp. 120-126), and More Fruit Insects of 1940—and 1941? by W. D. Whitcomb (pp. 126-132) (all Mass. State Col.).

Insect and disease control of fruit plants, T. E. ASHLEY (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 7, pp. 5-6).—A practical account.

Developments with the control of fruit insects during the past 75 years, J. S. HOUSER. (Ohio Expt. Sta.). (*Ohio State Hort. Soc. Proc.*, 75 (1942), pp. 113-125).

[Contributions on fruit insects] (*Oreg. State Hort. Soc. Ann. Rpt.*, 32 (1940), pp. 57-71, figs. 3).—Contributions presented at the 1940 meeting of the society include Some Observations on Codling Moth Flight and Worm Entries, 1940, by C. B. Cordy (pp. 57-60); and Codling Moth Control on Pears, by L. G. Gentner (pp. 61-64), and Progress Report on the Pear Psylla Control Program in the Pacific Northwest, by L. Childs (pp. 65-69) (both Oreg. Expt. Sta.).

Common insect larvae that attack the apple in Pennsylvania, S. W. FROST (*Pennsylvania Sta. Bul.* 420 (1942), pp. [2]+30, figs. 20).—This publication includes keys for the identification of insects injurious to apples and a discussion of common larvae that attack apple in Pennsylvania. Selected references to larvae that attack apples are listed.

Parasites of the oriental fruit moth and of certain weed-infesting larvae, M. L. BOBB (*Virginia Sta. Tech. Bul.* 79 (1942), pp. 23, figs. 9).—During the 8-yr. period covered by this investigation 45 species of parasites were reared from larvae of the oriental fruit moth, the ragweed borer *Epiblema strenuana* Walk., and the bidens borer *E. otiosana* Clem. and 2 species from the pupae of the oriental fruit moth. *Macrocentrus ancylivorus* Roh. represented 83.30 percent. *Glypta rufiscutellaris* Cress. 8.58, and *M. delicatus* Cress. 5 percent of the parasites reared, and these species were taken in 10 of the 11 localities where twig collections were made. More females were reared than males. Data obtained indicate that larvae of the oriental fruit moth are parasitized when 1 week or less in age. *E. strenuana* was heavily parasitized during 1940 and 1941 in Albemarle County. Parasites destroyed from 85.55 to 94.11 percent of *E. otiosana* in Spanish-needles and beggarticks from 1939 to 1941 and 95.5 percent of this borer in cocklebur in 1939. A higher percentage of oriental fruit moth larvae was parasitized in the early season in weedy orchards.

Spraying for control of grapeberry moth and grape leafhopper, R. HUTSON (*Michigan Sta. Quart. Bul.*, 24 (1942), No. 4, pp. 287-290, fig. 1).—As a result of experiments on the grapeberry moth during the last three growing seasons, the author concluded that (1) the use of arsenical sprays seems necessary, (2)

there is little difference in control until the number of arsenical sprays has been cut below three, and (3) fixed nicotine in the last two sprays will protect against both grapeberry moth and grape leafhopper.

Evaluating protection of fabrics from clothes moth and carpet beetle attack, R. E. HEAL. (N. J. Expt. Stas.). (*Jour. Econ. Ent.*, 35 (1942), No. 2, pp. 249-255).—Description is given of procedures for the maintenance of laboratory cultures of the webbing clothes moth, the black carpet beetle, and the furniture carpet beetle *Anthrenus vorax* Wtrh. on a known-age basis. A method is outlined for the evaluation of the protection of fabrics against attack by subjecting them to the feeding of larvae of the webbing clothes moth, black carpet beetle, and *A. vorax* under carefully controlled conditions. Data are presented to show that resistance of a fabric to the attack of the larvae of any single species does not assure that the fabric is effectively protected against the attack of other species.

The analysis of toxicity tests on mixtures of poisons, D. J. FINNEY (*Ann. Appl. Biol.*, 29 (1942), No. 1, pp. 82-94, fig. 1).

The examination of plants for insecticidal constituents, R. C. ROARK. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 2, pp. 273-275).

The insecticidal properties of certain species of *Annona* and of an Indian strain of *Mundulea sericea* ("Supli"), F. TATTERSFIELD and C. POTTER (*Ann. Appl. Biol.*, 27 (1940), No. 2, pp. 262-273, fig. 1).—It has been shown in preliminary laboratory insecticidal tests with several species of *Annona*, including *A. muricata*, *A. palustris*, *A. reticulata*, and *A. squamosa*, that plants of this genus possess contact insecticidal properties to aphids. *A. reticulata* was the most potent of those tested. Seed, root, leaf, and, to a less extent, the stems of this species possessed contact insecticidal properties. The seed of *A. muricata* and the leaves of *A. squamosa* and *A. palustris* also showed contact toxicity, but were not so potent as *A. reticulata*. The seed of *A. squamosa* was not available for testing purposes. None of the above are superior to the leaf, root, and bark of *M. sericea* of the variety known in India as Supli and are much less toxic than the richer specimens of *Derris elliptica* root such as Changi No. 3. The toxic action of the *Annona* spp. appears to be rather specific. Aphids are susceptible, but adult saw-toothed grain beetles, which are susceptible to the rotenone class of insecticides, are resistant. Tests made with extracts of a variety of *M. sericea* from India showed that leaf, bark, and root possessed marked insecticidal properties when tested on the chrysanthemum aphid and the saw-toothed grain beetle. This is in contrast with the African variety, the leaf and root of which are reported as distinctly less potent than the bark. The toxicity of none of these parts is of the same order as that of the root of *D. elliptica*, Changi No. 3.

Studies of nicotine as an insect fumigant, H. H. RICHARDSON and A. H. CASANGES. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 2, pp. 242-246, fig. 1).—Report is made of the results of laboratory work with nicotine vapor, using an air-flow apparatus, against 37 species of insects. The resistance to nicotine of the different insects varied widely. Thirteen species of aphids and thrips and 6 other species were killed by concentrations of 0.003 to 0.025 mg. per liter in 30-min. or shorter exposures at 25° C. (77° F.). The resistance of the green peach aphid varied greatly on three host plants. Nearly mature larvae of the southern armyworm and the corn earworm were much more resistant than young larvae, but there was little difference with the silkworm larvae. Comparative ratings of resistance made at 95-percent-kill concentration differed at times from those made at 50-percent-kill concentration. Because of its greater practical value the 95-percent rating seems preferable for use in making comparisons of resistance. Nicotine acts rapidly against some insects, giving complete

kill in a 1-min. fumigation. Short exposures to high concentrations were more effective than proportionately long exposures to low concentrations of gases. Gas concentration affected efficiency more than did exposure time. This relationship appeared fairly constant for each of the 4 insects tested over a limited range of exposures. Nicotine appeared much more toxic in the laboratory than hydrocyanic acid to several insects on the basis of a comparison with published results with the latter gas.

The effects of pyrethrins on certain mammals, C. S. LEONARD. (Univ. Vt.). (*Jour. Econ. Ent.*, 35 (1942), No. 2, pp. 261-264).—Experimental inoculations of rodents, including mice, white rats, guinea pigs, and rabbits, to determine the effects of pyrethrins are reported.

The problem of the evaluation of rotenone-containing plants, V, VI, J. T. MARTIN (*Ann. Appl. Biol.*, 27 (1940), No. 2, pp. 274-294, fig. 1; 29 (1942), No. 1, pp. 69-81, figs. 2).—Two further contributions (E. S. R., 80, p. 369).

V. The relative toxicities of different species of *Derris* (pp. 274-294).—In this work the relative toxicities to the bean aphid of different species and varieties of derris root were determined. *D. elliptica* (Changi root) was 2.5 times, *D. malaccensis* (Sarawakensis root) 1.75 times, and *D. elliptica* (Sarawak creeping root) 1.25 times as toxic as *D. malaccensis* (Kinta root). Preliminary trials have shown the relative toxicities of three of the roots to a stored products insect, the saw-toothed grain beetle, to be of a similar order. All toxicity data were subjected to statistical analysis. Various methods suggested for the chemical evaluation of derris have been examined and discussed. Methods based upon optical rotation values have been shown to fail in the evaluation of roots and resins of different species, while the method of Jones and Smith (E. S. R., 77, p. 70), in which a definite toxic value is given to the nonrotenone fraction of the derris extract, has been found to be inadequate when applied to the roots under consideration. The determination of the percentage "rotenone equivalent" values of the roots, based upon the alkaline fractionation of the resins and the toxicities of the deguelin and toxicarol fractions relative to that of rotenone, has given a reasonably close estimate of the toxicities of the derris roots examined. The application of the method to the assessment of the toxic value of derris resins is described.

VI. The toxicity of *l*-elliptone and of poisons applied jointly, with further observations on the rotenone equivalent method of assessing the toxicity of *derris* root (pp. 69-81).—In continuation of the study of this problem, the assessment of toxicity by determination of the rotenone equivalent is shown successfully to apply to four of the derris roots examined in the work previously reported. Observations on the stability of the resins in ground roots stored in tins at room temperatures have been recorded. *l*-Elliptone has been shown to be one-fifth as toxic as rotenone to the chrysanthemum aphid when tested in an alcohol-saponin medium. The toxicities of poisons applied jointly have been examined, and the observed toxicities of mixtures of rotenone with a deguelin concentrate, *l*-elliptone, and *l*- α -toxicarol have been compared with those predicted from the potencies of the constituent poisons, but no significant synergistic or antagonistic effect has been found. The bearing of this upon the validity of the rotenone equivalent method of assessing toxicity is discussed.

A rotenone-bearing variety of *Tephrosia virginiana* in New Jersey, J. M. GINSBURG, J. B. SCHMITT, and T. S. REID. (N. J. Expt. Stas.). (*Jour. Econ. Ent.*, 35 (1942), No. 2, pp. 276-280).

Methyl bromide-dichloroethyl ether emulsion as a soil fumigant, C. G. LINCOLN, H. H. SCHWARDT, and C. E. PALM. (Cornell Univ.). (*Jour. Econ. Ent.*, 35 (1942), No. 2, pp. 238-239).—Recent work indicates that a complete and

consistent kill of both larvae and adults of the alfalfa snout beetle at all levels can be obtained with a combination of methyl bromide and dichloroethyl ether emulsified with Aresklene. "To make this emulsion, equal volumes of the two fumigants and of water were taken. Aresklene was then dissolved in the water in an amount equal to 3 percent of the weight of the water. The dichloroethyl ether was added to the water and emulsified by shaking. In order to minimize loss by evaporation the methyl bromide cylinder was immersed in a mixture of ice and salt for about an hour before the material was drawn and added to the dichloroethyl ether emulsion. Only slight agitation was required to emulsify the methyl bromide. The amount of stock emulsion used on each 100 sq. ft. of soil was diluted with 5 gal. of water for use."

Results of the first test indicate that a dosage of 450 cc. of stock emulsion per 100 sq. ft. will give complete control of larvae and adults of the alfalfa snout beetle at all levels. At this dosage 1.5 cc. of each of the active ingredients are applied to each square foot of soil. Large amounts of water following application of the fumigant appear to be unnecessary. A second test, made in mid-October to determine whether dosages of less than 450 cc. per 100 sq. ft. would be effective, indicated that this dosage approaches the minimum which can be used against this insect, that 300 cc. is inadequate, and that 600 cc. is probably a safe dosage to recommend.

[The use of petroleum oils as insecticides.—IV,] The efficiency of dormant type oils in relation to their composition, G. W. PEARCE, P. J. CHAPMAN, and A. W. AVENS. (N. Y. State Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 2, pp. 211-220, figs. 2).—A study made of the insecticidal efficiency of 39 petroleum oils of the dormant type, using the fruit tree leaf roller as the principal test insect, is reported in this fourth of the series (E. S. R., 86, p. 355). Correlations between efficiency in controlling this insect and various properties related to the constitution of the oils were observed. Data on viscosity, viscosity index, unsulfonated residue, density, refractive index, specific refraction, specific dispersion, and the "Waterman analysis" are given for each oil. These data show that an oil that is highly paraffinic in character and probably low in aromatic structures is the most desirable type for use in the control of the fruit tree leaf roller. Theoretical and practical implications of the results of the study are discussed.

Deposition of lead from lead arsenate spray mixtures and its retention on Pyralin plates and apple leaves and fruits, H. N. WORTHLEY and D. E. H. FREAR. (Pa. Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 2, pp. 205-210, figs. 2).—The laboratory study reported revealed certain relationships in the deposition and retention of lead from various spray mixtures. Certain of these were substantiated by parallel field experiments. Further study is necessary to develop methods by which laboratory investigations of spray deposition and retention on artificial surfaces may safely be used to forecast field results with the same spray mixtures applied to various plant surfaces.

The grasshoppers and other Orthoptera of Arizona, E. D. BALL, E. R. TINKHAM, R. FLOCK, and C. T. VORHIES (*Arizona Sta. Tech. Bul.* 93 (1942), pp. [2]+255-373, figs. 15).—This publication includes 282 species and varieties of Orthoptera. Distribution, food plants, ecological associations, economic importance, and control measures are discussed. Illustrations and keys aid in generic and specific separation of the Arizona species. A bibliography is included which notes the more important publications on Arizona Orthoptera.

The relative effectiveness of dust mixtures against the German cockroach, J. E. DEWEY. (Univ. Tenn.). (*Jour. Econ. Ent.*, 35 (1942), No. 2, pp. 256-261).—Laboratory studies on the relative effectiveness of dust mixtures

against the German cockroach, in which 41 different materials involving 89 tests were used, are reported.

Rearing grasshoppers under laboratory conditions, M. H. HAYDAK. (Minn. Expt. Sta.). (*Science*, 95 (1942), No. 2478, pp. 657-658).

The blueberry thrips, F. H. LATHROP. (Maine Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 2, pp. 198-201, figs. 3).—In experimental treatments for the control of the blueberry thrips *Frankliniella vaccinii* Morg., commenced in 1936, the most promising results were obtained from kerosene emulsion. On each of the three plats used the number of thrips-infested plants was greatly reduced by the treatment. The distribution of the infestation on the spring-treated plat suggests that the thrips that survived in this case may have been protected by the wooden frame. Ethylene dichloride emulsion and dichloroethyl ether appeared to be of little or no value. It is interesting to notice that there was a distinct and consistent increase in the number of infested plants on the plats treated with carbon disulfide emulsion. A somewhat similar effect was noticed in 1936, when there was an apparent increase in the number of thrips-infested plants on areas treated with flake naphthalene. None of the soil insecticide treatments caused injury to the blueberry plants, except that when kerosene emulsion was applied in both fall and spring the plants were severely injured. With a single treatment of kerosene emulsion, either fall or spring, no injury was noticed. In view of the satisfactory results obtained with kerosene emulsion, it is planned to continue the investigation in an effort to develop the treatment into a practical method for the control of *F. vaccinii*.

Orchard sprays and the white apple leafhopper, W. J. SCHOENE. (Va. Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 2, pp. 220-222).—The studies here reported show that the fungicides in common use may actually reduce the number of white apple leafhoppers that mature, and that there is nothing to indicate that the sprays are beneficial to them. The results of certain tests not previously reported indicated that applications of nicotine to the foliage would reduce the number of leafhopper eggs that hatched, and that nicotine used in this experiment appreciably reduced the number of nymphs at dilution of 1:800.

Toxicities of bordeaux mixture, pyrethrum, and derris to clover leafhoppers, T. C. WATKINS. (Cornell Univ.). (*Jour. Econ. Ent.*, 35 (1942), No. 2, pp. 234-236, fig. 1).—A series of immersion tests of adult clover leafhoppers (*Aceratagallia sanguinolenta* Prov.) in bordeaux mixture and aqueous suspensions of pyrethrum and derris is reported. The greatest kill obtained with derris was 52 percent at a concentration equivalent to 16 lb. of 5 percent rotenone per 100 gal., whereas 100-percent kill with pyrethrum was obtained at a concentration equivalent to 4 lb. of ground flowers containing 0.5 percent pyrethrins per 100 gal. Dosage-mortality curves for results of tests with pyrethrum and derris are presented, as are also comparisons of these results with those obtained in previous tests on potato leafhoppers.

The Taxus mealybug *Pseudococcus cuspidatae* Rau, C. C. HAMILTON. (N. J. Expt. Stas.). (*Jour. Econ. Ent.*, 35 (1942), No. 2, pp. 173-175, fig. 1).—For several years the mealybug *P. cuspidatae* has been a serious pest of evergreens of the genus *Taxus* in nurseries and ornamental plantings in New Jersey, and in some instances has become so abundant as almost to cover the trunk and the principal branches and occur in masses where the twigs branch, furnishing roughened places favorable for them to develop. It is usually found more abundantly on those species with dense foliage such as *T. cuspidata nana* and *T. cuspidata wardii*. It is also reported as having been collected in the adult stage on apple, basswood, cedar, maple, and rhododendron, although it probably does not breed on these plants. A comparison made in June 1940 of

several materials to determine their effectiveness in the field revealed all of these spray materials, when thoroughly applied, to give a good kill of the mealybugs. The nicotine and soap spray was distinctly better than the other materials, no injury to any of the plants resulting from its application. A miscible carbolineum spray applied in the nursery during the summer of 1941 at a dilution of 1 to 100 parts of water also gave a good kill of mealybugs without injury to the plants. Control of the mealybugs in the dormant period has not as yet been investigated.

Further notes on the control of the pea aphid, H. G. WALKER and L. D. Anderson. (Va. Truck Expt. Sta.). (*Va Acad. Sci. Proc.*, 1941, p. 184).—An abstract of a contribution on further work with the pea aphid (E. S. R., 84, p. 80; 85, p. 375).

Transmission of potato virus Y by *Aphis rhamni* (Boyer), B. KASSANIS (*Ann. Appl. Biol.*, 29 (1942), No. 1, p. 95).—Transmission experiments, summarized in an accompanying table, have shown that, in the greenhouse at least, *A. rhamni* is as efficient a vector of potato virus Y as the green peach aphid, and that it reacts to a preliminary starving period in the same way.

The present threat of westward spread of the gipsy moth, H. L. MCINTYRE (*Jour. Econ. Ent.*, 35 (1942), No. 2, pp. 171-173).

Studies on rotenone and other organic insecticides for codling moth control, S. W. HARMAN. (N. Y. State Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 2, pp. 223-224).—The results of a series of field experiments conducted during the past 4 yr., in which rotenone-bearing materials and certain other organic compounds were tested against the codling moth under conditions of severe infestation, are reported. It is pointed out that the field of usefulness for organic insecticides has steadily increased. Nicotine sprays have been accepted as offering a practical means of combating the codling moth, and more recent tests have shown that the powdered rotenone-bearing roots promise to be useful additions to the apple spray programs. The latest tests have indicated that rotenone is not only valuable as a primary insecticide, but especially promising results have been secured when the powdered root has been used in combination with other materials.

Extracts of apple peels as adjuvants to lead arsenate against the codling moth larva, E. H. SIEGLER and H. A. JONES. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 2, pp. 225-226).—In work in the laboratory lead arsenate combined with alcoholic extracts of apple peels, from both ripe and green apples, was compared with lead arsenate alone against the newly hatched codling moth larva. The alcoholic extracts were purposely varied with respect to their content of nonvolatile extractives. Extracts which contained only small quantities of nonvolatile extractives did not significantly increase the effectiveness of lead arsenate, but extracts with higher concentrations did improve its significance.

An investigation of the mineral oil treatment for corn earworm control, L. A. CARRUTH. (N. Y. State Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 2, pp. 227-233, fig. 1).—An investigation of the mineral oil treatment and its modifications, conducted during the 4-yr. period from 1938 to 1941 in Nassau County, N. Y., on western Long Island, is reported, the details being given in eight tables. This oil treatment involves the deposition of a small quantity of highly refined white oil, usually of U. S. P. grade, in the "silk channels," within the husk tips, of developing sweet corn ears between the tip of the cob and the exterior. This forms an insecticidal barrier between the earworm larvae and their preferred food. The effectiveness and practicability of this treatment may be influenced by a number of factors, of which the following

are discussed: Dosage per ear, ear tip stunting, the value of added insecticides, insecticide concentrations, oil viscosity, oil refinement, time of application, and crop uniformity.

The findings have led to the conclusion that such treatment has provided a more nearly satisfactory means for controlling the corn earworm than methods previously investigated, including insecticidal sprays. Special technics have been developed for the application of the oil treatments and the recording of experimental data. A mineral oil of U. S. P. quality with a viscosity between 175 and 210 Saybolt sec. (100° F.) was found most satisfactory for general use, since oils of lower viscosities produced excessive ear tip stunting. It was indicated that oils having viscosities as low as 125 sec. might prove acceptable as lower effective dosages per ear are established. A single treatment at a dosage between 0.5 and 0.6 cc. per ear should give relatively good earworm control, and dosages as low as 0.25 cc. proved effective in certain experiments. A preliminary investigation indicated that oils of slightly less refinement did not differ significantly in performance from highest U. S. P. quality oils, although, as yet, they should probably not be substituted for the latter. The addition of an insecticide definitely increased the effectiveness of the mineral oil treatment and, at ordinary dosages, did not significantly increase the amount of ear tip stunting. Relatively good control was obtained with oil containing as low as 0.1 percent pyrethrins or 1 percent dichloroethyl ether, although double these quantities have usually been suggested. Oil insecticide treatments applied 5 to 7 days after silking were relatively effective. Treatments applied even later gave relatively good control in certain tests, although a danger of greater earworm injury was found when heavy infestations were present.

Methyl bromide fumigation for control of the narcissus bulb fly, F. S. BLANTON. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 2, pp. 239-241).—The study reported indicates that methyl bromide is an effective fumigant for the control of narcissus bulb fly larvae. Incidental records indicated that this treatment is also effective against the lesser bulb fly larvae and the bulb mite. The bulbs will tolerate a 3-lb. dosage at 70° F. for 4 hr. without harmful effects. With proper fumigation equipment this will constitute a rapid method of treating bulbs, and after additional mortality records are taken a shorter treatment possibly may be recommended which will speed the process of fumigation on a commercial basis.

Effect of sesamin and related compounds on the insecticidal action of pyrethrum on houseflies, H. L. HALIFE, F. B. LAFORGE, and W. N. SULLIVAN (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 2, pp. 247-248).—The results thus far obtained in work with sesamin and related compounds indicate that an important practical field has been opened which may lead to the discovery of other synergists perhaps more active and readily available than sesamin or asarinin.

The increasing importance of coleopterous borers in shade trees, E. P. FELT and S. W. BROMLEY (*Jour. Econ. Ent.*, 35 (1942), No. 2, pp. 169-171).

The influence of host plants on the local distribution of Japanese beetles and on the effectiveness of traps, F. B. WHITTINGTON, E. N. CORY, and G. S. LANGFORD (*Jour. Econ. Ent.*, 35 (1942), No. 2, pp. 163-164).—The experiments considered are offered as further evidence of the influence of hosts on the local distribution of Japanese beetles and on the effectiveness of traps. In one experiment involving the use of 25 Japanese beetle traps, a row of 5 traps, 50 ft. apart and 10 ft. from the border of a rose garden, trapped over 2.5 times as many beetles as any of the other similar rows of traps at 160, 310, 460, or 610 ft. distance. A second series of experiments involved the use of 114 traps

distributed in six towns. The 57 traps spaced 100 ft. from the host plants averaged 297 beetles, while the same number at 10 ft. averaged 847, or approximately 2.8 times as many. The tests indicate that traps operated 5 to 10 ft. from preferred hosts catch from 2 to 2.5 times as many beetles as traps operated 100 ft. from hosts. Further interpretation of the results leads to the conclusion that traps are not responsible for the large number of beetles on some properties and the relatively small number on adjoining properties, but that this variation in population is due primarily to the kind and abundance of host plants.

The adult Japanese beetle as host and disseminator of type A milky disease, G. S. LANGFORD, R. H. VINCENT, and E. N. CORY. (Univ. Md.). (*Jour. Econ. Ent.*, 35 (1942), No. 2, pp. 165-169).—The results obtained in experimental work with the type A milky disease organism (*Bacillus popilliae*) indicate that the adult Japanese beetle is a host for this organism, a factor in the spread of the disease, and a possible medium for the propagation of spores for use in its artificial spread.

Control of native white grubs in young hemlocks, H. H. SCHWARDT. (Cornell Univ.). (*Jour. Econ. Ent.*, 35 (1942), No. 2, pp. 176-177, fig. 1).—The results of a series of soil treatments applied during the summer of 1941 for the control of outbreaks of native white grubs which had occurred in several parts of New York State, causing heavy damage to young evergreens in both nurseries and reforestation plantings, are briefly noted. Of the five insecticides tested, the paradichlorobenzene treatment gave the best results.

Protecting lawns from injury by grubs, F. L. GAMBRELL and A. B. BUCHHOLZ (*Farm Res. [New York State Sta.]*, 8 (1942), No. 3, p. 3, figs. 2).—A practical account.

Descriptions of the larvae of some West Indian melolonthine beetles and a key to the known larvae of the tribe, A. G. BÖVING (*U. S. Natl. Mus. Proc.*, 92 (1942), No. 3146, pp. 167-176, pls. 2).

Controlling rose chafer, R. HUTSON and F. SHERMAN III (*Michigan Sta. Quart. Bul.*, 24 (1942), No. 4, pp. 292-294, fig. 1).—Experimental work indicates that pyrethrum sprays and dusts are satisfactory for the control of the rose chafer. Pyrethrum sprays should contain a good wetting agent and be used at the rate of 1 pt. of 0.2 percent pyrethrin content spray per 100 gal. Heavy lime sprays will prevent reinfestation on fruit trees.

Laboratory tests with insecticides against the tobacco flea beetle, G. WENE and C. B. DOMINICK. (Va. Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 2, pp. 183-184).—Description is given of a method for comparing the effectiveness of insecticides against the tobacco flea beetle. A total of at least 200 beetles in all were used at each of several dilutions. A dilution of 1 gm. of the insecticide to 50 gm. of solution gave a calculated residue of 0.0128 mg. per square centimeter of leaf surface. At this dilution rotenone showed a kill of 99.12 percent at the end of 24 hr. At the end of 72 hr. basic copper arsenate had killed 80.89 percent of the beetles, cryolite 55.87, Dutox 59.57, lead arsenate 39.30, and phenothiazine 8.29 percent. As indicated in the data presented, the rotenone continued to be effective at dilutions up to 1:1,200. On the other hand the kill with the arsenicals was greatly reduced at dilutions of 1:100 and 1:200. The tobacco flea beetles did very little or no feeding on the rotenone-treated leaves, which indicates that rotenone probably acts by contact.

Life history of the wireworm *Aeolus mellillus* (Say), H. H. JEWETT (*Kentucky Sta. Bul.*, 425 (1942), pp. 11, fig. 1).—*A. mellillus* was found to be parthenogenetic under Kentucky conditions. Overwintering adults produced eggs

from early May until after the middle of September. Larvae from some of these eggs produced adults the same season, the period from egg deposition to the adult stage averaging about 75 days. Some of the early appearing adults oviposited eggs for a second generation of wireworms. The time from egg laying to the adult stage for overwintering wireworms ranged from 276 to 369 days. Overwintering larvae cause heaviest damage to spring-planted crops. Since most of these larvae pupate by June 30 in central Kentucky, late-planted crops are more likely to escape heavy injury than crops planted earlier. Unplowed sod is the preferred place for oviposition, and, since egg laying begins about May 1, crops planted on sod land plowed earlier in the spring are less likely to be injured than those planted on late-plowed sod land. Cultivated land kept clean the year following sod and sowing small-grain cover crops as late in the fall as practical will largely prevent infestation with larvae the second year.

The sweet clover weevil, J. A. MUNRO and H. S. TELFORD (*North Dakota Sta. Bimo. Bul.*, 4 (1942), No. 6, pp. 21-22).—A practical account of a new and serious pest of sweetclover, *Sitona cylindricollis* (F.).

Pellet bait for control of the alfalfa snout beetle, C. G. LINCOLN. (Cornell Univ.). (*Jour. Econ. Ent.*, 35 (1942), No. 2, pp. 236-237).—In control work with the alfalfa snout beetle, soybean meal-granulated sugar-sodium fluosilicate bait was highly effective when the bait was pressed into pellets by putting it through a power meat grinder but much less effective when not pressed into pellets. Under conditions prevailing in northern New York in April and May a bait must remain moist and attractive to the beetles during periods of hot, cold, cloudy, and, if possible, rainy weather. The meal bait dries out rapidly and sifts into the dust and trash on the soil surface, whereas the pellet bait withstands drying and the pellets are large enough to stand up above the trash and dust.

Some observations of *Ips* bark beetle attack on pine trees, L. A. HETRICK. (Va. Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 2, pp. 181-183, figs. 2).—A study of four species of bark beetles of the genus *Ips*, which attack growing pine trees, has indicated that trunk and crown injuries, root injuries, and reservoirs of infestation are responsible for many killings. In other cases no apparent reason could be found for attack of apparently healthy pine trees. Because of the similarity of these killings to killings that could be attributed to root injuries, it is suggested that some unknown root condition may be responsible for the attractiveness of the trees to bark beetles.

Toxic and repellent sprays for the control of elm bark beetles, R. R. WHITTEN (*U. S. Dept. Agr. Cir.* 647 (1942), pp. 12, figs. 2).—Nineteen spray formulas containing naphthalene flakes, orthodichlorobenzene, chlorinated naphthalene, diphenyl flakes, and pentachlorophenol were experimentally tested for their toxic or repellent action to the two principal elm bark beetles, namely, the smaller European elm bark beetle and the native elm bark beetle. The cost per gallon ranged from 12 to 55 ct. All sprays were applied to the outer bark of infested or noninfested elm logs until the entire surface was thoroughly wetted. In the toxicity tests the age of the brood and bark moistures from 80 to 189 percent had no deleterious effect on the results. Air temperatures above 50° F. were conducive to more uniform results. Orthodichlorobenzene and monochloronaphthalene were the two most effective toxic and repellent materials. Good repellency was obtained from one application for an entire active season. Several of the mixtures were applied to tightly staked 1-cord piles of elm logs under field conditions with good results in respect to repellency and kill. The cost of materials per cord ranged from 49 to 78 ct.

Reactivation of *Ceratostomella ulmi* in occluded infections and contamination of *Scolytus multistriatus*, W. D. BUCHANAN and S. J. SMUCKER. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 2, pp. 178-180).—Little evidence was obtained through experimentation of the reactivation of the Dutch elm disease fungus *C. ulmi* through feeding injuries made by 11,400 smaller European elm bark beetle adults. The results show that these beetles may become contaminated with *C. ulmi* as a result of their feeding in the trunks and crotches of elms with active or occluded infections.

Preliminary investigations on the value of electric heating of beehives, C. G. BUTLER and G. F. COCKBILL (*Ann. Appl. Biol.*, 29 (1942), No. 1, pp. 34-42).

Studies of the mite *Eupitimerus hystrix* Nalepa on timothy, B. B. PEPPER. (N. J. Expt. Stas.). (*Jour. Econ. Ent.*, 35 (1942), No. 2, pp. 201-204, figs. 3).—This contribution relates to *E. hystrix*, first recorded in the United States at Arlington, Va. It first came to attention and was a serious pest in timothy fields in the Freehold area of Monmouth County, N. J., in the spring of 1938. By 1939 it had spread into Middlesex, Ocean, Atlantic, and Mercer Counties, and by 1940 several timothy fields in Burlington, Somerset, and Hunterdon Counties were seriously damaged. In 1941 specimens were collected in every county in the State, and the injury was quite severe. Only timothy and orchard grass (*Dactylis glomerata*) have been found as hosts of the mite, which prefers to feed on the tender growing tips of the timothy plant, since most of the mites have been found on the unfolding leaves. Little is thus far known of its life history and habits. The most promising control measure for the mite is pulverized calcium cyanamide and sulfur dust. Cyanamide acts as a contact poison to the mite and also as a fertilizer for the crop. Sulfur destroys a large percentage of the mites, but does not possess the stimulating effects on the crop of cyanamide. Rotenone dust did not prove effective against the mite. Oil emulsions and two dinitro compounds in dust form caused severe reductions in yield. Burning over the timothy fields before growth begins in the spring has proved unsatisfactory.

ANIMAL PRODUCTION

[Livestock investigations by the Florida Station] (*Florida Sta. Rpt. 1941*, pp. 59-60, 62, 63-64, 65-67, 68-69, 167, 176-177, 185-188, 189, figs. 4).—Brief results are presented by W. M. Neal, L. L. Rusoff, W. G. Kirk, D. J. Smith, A. L. Shealy, N. R. Mehrhof, E. F. Stanton, D. F. Sowell, O. W. Anderson, Jr., R. M. Crown, J. C. Driggers, R. E. Blaser, F. T. Boyd, R. W. Kidder, V. E. Whitehurst, Jr., and J. D. Warner of projects on the cobalt and copper supplied cattle by forage; grazing tests of Napier grass with beef cattle; deficiencies of peanuts as a feed for swine; vitamin D of shark-liver oil for poultry; the comparative value of sugarcane silage, shocked sugarcane, and pasture supplemented with cottonseed meal or cottonseed cake for wintering beef cattle; methods of feeding grain to layers; molasses for fattening steers; the use of laboratory animals for mineral nutrition problems of livestock; rotational grazing and internal parasites in sheep production; feed requirements for hogs of various market grades; calcareous mineral supplements for poultry breeding; biological analysis of fertilized and unfertilized pasture herbage; pasture investigations on peat and muck soils of the Everglades with beef cattle; fattening steers on winter pastures with ground snapped corn, ground shallu heads, molasses, and cottonseed meal; copper, cobalt, and aluminum requirements of beef cattle; feed crop production and utilization with beef cattle; kudzu and peanut hays for fattening steers; Brahman and Angus steers as feeder cattle; effect of varying amounts of roughage in feeds on finish and quality of Hereford steers; and oats pasture as a

supplement to corn and tankage and mineral supplements in rations for fattening hogs.

[Livestock experiments by the Kentucky Station] (*Kentucky Sta. Rpt. 1941*, pp. 22, 23-25, 26, 46).—Results are briefly presented on investigations of rye v. bluegrass and alfalfa hay v. red clover hay for pregnant ewes; continuous and rotational grazing of bluegrass pastures by ewes and lambs; comparison of sheared and unsheared lambs; creep-feeding cracked corn for suckling lambs; comparative tests of castrating and docking lambs; alfalfa-molasses silage v. alfalfa hay for steers; comparison of distillers' corn dried grains v. cottonseed meal for beef cows; relationship of relative humidity to hatchability of turkey eggs; different methods of feeding protein supplements to poultry; the relation of a hen's ration to the egg yolk fat during incubation; and carrying capacity of fertilized and unfertilized pastures for beef cattle.

[Livestock production by the Wyoming Station] (*Wyoming Sta. Rpt. 1941*, pp. 11, 12, 25-27, 33, 37-38).—Results are briefly recorded on investigations of the relation of protein to egg production in poultry; the growth and quality of meat of turkeys fed different grain rations; deficiencies in calcium and phosphorus in cattle rations; variations in the quantity and relation of scoured wool to price; the use of fiber coats for sheep; different roughages for wintering beef calves; different kinds of housing for egg production; rations for fattening lambs; and wet beet pulp v. silage for steers.

Filling the silo with corn or sorghum, J. E. COMFORT (*Missouri Sta. Cir. 239* (1942), pp. 4).—General directions are given for filling, cutting, and harvesting corn and sorghum for the silo.

Vitamins in live stock feeding—1942, T. S. HAMILTON. (Univ. Ill.), (*North Amer. Vet.*, 23 (1942), No. 5, pp. 306-308).—There are tabulated the effects and sources of the various vitamins essential in livestock and poultry nutrition.

Alfalfa hay, war-important feed, is shown to vary considerably in mineral makeup, J. W. TORSKA, C. E. VAIL, and E. DOUGLASS (*Colo. Farm Bul. [Colorado Sta.]*, 4 (1942), No. 3, pp. 24-26).—The authors point out the considerable variability of alfalfas with respect to mineral nutrient content, tabulating the minimum content, content of good alfalfa, and the maximum content found for the following ash components: Silica, sulfates, carbonates, phosphates, chlorides, calcium, magnesium, potassium, and sodium. It is emphasized that the highest silica content found, about 0.75 percent, is very much lower in proportion to the total ash content than is that of most grass hays, and the nutrient mineral content correspondingly greater.

Commercial feeding stuffs, L. S. WALKER and E. F. BOYCE (*Vermont Sta. Bul. 478* (1941), pp. 64).—The usual report (*E. S. R.*, 86, p. 227) of the guaranty and found analysis of 1,931 official samples of feeds collected in Vermont in April and August 1941, with a statement regarding those samples failing to comply with their guaranteed analyses and the presence of deleterious and toxic material.

Synergism between thyrotropic and growth hormones of pituitary. Body weight increase in hypophysectomized rat, W. MARX, M. E. SIMPSON, and H. M. EVANS. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 49 (1942), No. 4, pp. 594-597).—A synergistic effect of purified growth hormone when given with thyrotropic hormone to hypophysectomized rats was noted by an increase of 22.1 gm. in 15 days from the growth hormone alone, 31.8 gm. from the combination, but only 5.9 gm. when thyrotropic hormone was administered alone. The study was conducted with 3 lots of 21, 28, and 29 hypophysectomized rats each with one hormone or the other or a combination, and with 1 lot of 13

[Investigations with beef production by the Arizona Station] (*Arizona Sta. Rpt. 1941, pp. 37-39, 43-44*).—Brief results are presented of feeding experiments of Manko—a new grain sorghum—silage v. hegari silage, molasses mixed with hay and silage, grapefruit refuse silage, whole cottonseed v. cottonseed meal, hegari silage in a standard fattening ration, pasturing alfalfa and alfalfa barley mixtures; and relationships of judging points, body measurements, color, bone, etc. of carcass quality in steers.

Cattle feeding test at Akron indicates good method of marketing dryland feed, R. C. TOM (*Colo. Farm Bul. [Colorado Sta.], 4 (1942), No. 3, pp. 14-16, figs. 2*).—An improved variety (Coes) of sorghum grain proved to be 89 percent as efficient as corn when fed alone to Hereford steers and 92 percent as efficient as corn in a grain mixture. Steers fed Coes sorghum grain showed less finish and desirability of carcass than the best steers receiving a grain mixture with sorghum silage which produced a high finish. Calculi were found in many of the steers.

Feeding experiments with beef cattle to determine nutritive values of first-, second-, and third-crop alfalfa hay, F. B. HEADLEY. (Coop. U. S. D. A.). (*Nevada Sta. Bul. 161 (1942), pp. 17, figs. 5*).—In 4 years' experiments first, second, and third cuttings of alfalfa hay were compared for beef cattle. The first cutting generally proved superior to the second cutting in all hay rations fed during the first 8 weeks. Differences between the first and third cuttings were not significant. When the different cuttings were fed comparatively to steers or heifers in 8-weeks fattening periods with a grain ration of barley and beet pulp, the results for all the years were in general most favorable to the first cutting of alfalfa, although equal gains were produced by those receiving the third crop hay. There was no significant difference in the first year from whole or chopped hay, but chopped hay only was fed during the last year. The results were based on the progress made by groups of eight head of steers or heifers individually fed with each type of hay. Data are included on the chemical composition and mineral content of the hays of each cutting in the several years and an estimation of the hay and grain required by fattening beef cattle.

Mineral study under way seeks method of best supplying needs of beef cattle, A. E. CULLISON (*Miss. Farm Res. [Mississippi Sta.], 5 (1942), No. 7, p. 8*).—A discussion of mineral deficiencies encountered in livestock feeding and plans of a mineral experiment under way.

Sweetpotato meal versus corn for finishing calves, A. E. CULLISON (*Miss. Farm Res. [Mississippi Sta.], 5 (1942), No. 7, pp. 1, 7*).—In a feeding test of 142 days' duration 6 steer calves were finished on a ration of dehydrated sweetpotatoes, cottonseed cake, sorghum silage, and Johnson grass hay making average daily gains of 2.07 lb. Another group of 10 steer calves with corn replacing the dried sweetpotatoes made average daily gains of 2.29 lb. with slightly less cottonseed meal consumed. These results indicated that the dehydrated ground sweetpotatoes have considerable promise as a cattle fattening feed.

Rations for ewes in lambing camp, H. HACKEDORN, H. P. SINGLETON, and W. H. BURKITT (*Washington Sta. Bul. 413 (1942), pp. 22, figs. 2*).—Feeding groups of 20-30 ewes with lambs during 1937, 1938, and 1940 at the Prosser Substation showed no significant differences between potatoes, sugar beets, rutabagas, or beet molasses. It was calculated that on the basis of alfalfa hay potatoes were worth 15-25 percent as much; sugar beets 35; and wet beet pulp 6.5-7.5 percent. Beet molasses showed injurious effects both when utilized as the only concentrate and when fed with corn or barley. Cane molasses and oats on a replacement basis of pound for pound was slightly inferior to oats alone. There was no significant difference in results between oats and peas when fed with beet molasses.

Mississippi-grown feeds for fattening pigs, P. G. BEDENBAUGH (*Miss. Farm Res. [Mississippi Sta.], 5 (1942), No. 7, pp. 1, 2*).—In experiments involving 5 lots of 10 pigs each fed for about 50–60 days average daily gains of 1.12 lb. were produced with sweetpotato meal and tankage. Rations of corn or barley and tankage produced average daily gains of 2.14 and 1.85 lb. per head, respectively. When the rations consisted of commercial and home-grown oats with the tankage the average daily gains were 1.52 and 1.35 lb., respectively. The calculated values of the different feeds, based on their conversion into pork, were estimated.

Proso, corn and barley as feeds for hogs on alfalfa pasture, F. W. CHRISTENSEN, P. E. JOHNSON, A. SEVERSON, E. P. PAINTER, and T. H. HOPPER (*North Dakota Sta. Bul. 318 (1942), pp. 13*).—In experiments conducted over a 3-yr. period on alfalfa pasture with approximately 30 pigs on each grain, singly and in combination, it was found that the best rate of gain, 1.5 lb. per head daily, was made with corn and proso with the protein supplement of tankage and linseed meal 2:1. Almost equal rates of gain were made with barley and corn but with proso as the single grain concentrate the average daily gains were reduced to 1.13 lb. Proso alone seemed somewhat less palatable than barley or corn, required more feed per unit of gain, and produced smaller gains. Barley produced a somewhat firmer carcass than corn but proso produced a softer fat although not objectionable.

Soybean oil meal and pasture with corn for pigs, V. A. FREEMAN (*Michigan Sta. Quart. Bul., 24 (1942), No. 4, pp. 310–312*).—There are briefly reported the results from feeding pigs averaging about 40 lb. of weight to final weights of approximately 200 lb. The results showed that pigs prefer heat-treated or roasted soybean meal to raw solvent process meals. The average daily gains when the supplements consisted of tankage, expeller, raw solvent, or roasted solvent soybean meal were respectively 1.29, 1.34, 1.08, and 1.23 lb. per head. In another experiment soybean flake was higher in protein content but no more palatable to pigs under 100 lb. than the expeller product.

Peanut meal in the swine ration, Z. A. MASSEY, T. S. BOGGESE, JR., and K. T. HOLLEY (*Georgia Sta. Cir. 138 (1942), pp. 7*).—In two experiments with lots of 7 and 8 pigs each economical results were obtained with peanut meal and tankage as a supplement to corn. In the first trial the average daily gain per head with corn and tankage was 1.53 lb., while with peanut meal and tankage mixed about 9:1 it was 1.83 lb. About 3.5 lb. of feed were required per unit of gain. In a second experiment a protein mixture of 19 parts peanut meal to 1 part tankage produced average daily gains of 1.55 lb. as compared with 1.64 lb. by pigs on a 9:1 protein mixture. Failure accompanied attempts to self feed a mixture of three parts peanut meal and one part corn but the mixture was satisfactorily hand-fed as a slop.

Methods of hastening absorption of salt in farm-cured ham, P. T. ZEIGLER and R. C. MILLER (*Pennsylvania Sta. Bul. 427 (1942), pp. [1]+8, figs. 2*).—Supplementing previous curing studies (E. S. R., 79, p. 377), the optimum curing period for hams pumped with 10 percent of their weight with 75° pickle and cured in a cover pickle of the same strength proved to be 2.5 days per pound. Unpumped hams required 4 days more per inch of ham. When the hams were sharp frozen they could be left in the pickle without thawing. They absorbed salt as rapidly in both the 75° and 85° pickle as thawed hams and it was advantageous in keeping down the temperature. Forcing the pickle into the center of the ham reduced the curing time about three-fourths to 1 day per pound of ham. Unchilled hams were successfully dry sugar cured at a room temperature of 65° F. in 2.5 days per pound. In the conduct of this study the penetration of the 75° and 85° brine into 1-in. slices of ham removed at

6-9 day intervals were ascertained following the different treatments. Tenderizing ham by arterial curing with 10 percent of a 60° pickle was accomplished in 12-15 days regardless of the size of the ham employed. Smoking and the production of ready-to-eat hams are discussed.

[Studies with poultry nutrition by the Massachusetts Station] (*Massachusetts Sta. Bul.* 388 (1942), pp. 97-98, 99).—Results are briefly reported by R. T. Parkhurst, M. S. Gutowska, C. R. Fellers, E. M. Parrott, R. M. Verberg, W. C. Sanctuary, C. I. Gunness, and J. H. Vondell of investigations in comparing crab meal and fish meal for poultry rations; the effect of excesses of calcium in the poultry diet; sources of calcium, including calcite flour, for laying hens; electric brooding; and restricted feeding with range for pullets and hens.

Poultry products research: A guide for research workers, including a list of some problems in project form, edited by G. F. STEWART (*Iowa Sta. Res. Bul.* 299 (1942), pp. 697-773).—Important problems in the scientific research and technical control of poultry products are outlined in project form as to significance, personnel and facilities, and suggested procedure as a service in creating new uses and the development of new standards and as a guide for new workers. Twenty-four egg and 28 poultry projects are presented. There were 51 contributors.

War-time poultry feeding, E. T. HALNAN (*[Gt. Brit.] Min. Agr. and Fisheries "Growmore" Bul.* 5 (1942), pp. II+9).—Very popular and brief instructions are given on rations for rearing, growing, and laying poultry, with suggestions on substitute feeding stuffs for wartime. A brief statement is included on feeding ducks and geese.

Feeding systems for laying hens, E. W. CALLENBACH and R. R. MURPHY (*Pennsylvania Sta. Bul.* 425 (1942), pp. [2]+26, figs. 6).—In 3 yr. comparisons of different methods of feeding laying hens as affecting production, weight, and mortality the maintenance of a high total feed intake of a well balanced mash and sensible grain mixture or individually fed grains rather than the ratio between grain and mash or high mash consumption seemed to be the critical feeding factor in the experiment. The feeding of wet mash and condensed buttermilk did not improve biological performance but increased the labor requirement. Free-choice grain feeding permits the most efficient use of available labor. Feeding at least part of the grain in the litter helps to keep it in better condition. These experiments were conducted with 7 lots of 40 White Leghorn hens each from September 1936 to September 1937, and 7 lots in 1937-38 and 8 lots in 1938-39 of 50 Barred Plymouth Rock hens each. The influence of free-choice and limited feeding of grain in different combinations were compared. Results in general equal, but neither superior nor inferior, to those with a standard 18.5 percent protein mash were obtained with a high protein (31.5 percent) mash and a free choice grain mixture.

Growing chickens, W. M. VERNON, W. R. WHITFIELD, and H. L. WILCKE (*Iowa Sta. Bul.* P47, n. ser. (1942), pp. 529-552, figs. 18).—General directions are given for growing, feeding, and management of chicks from day old to laying age, including methods of brooding and provisions necessary for the inclusion of the essentials of growth in poultry.

Percentage utilization and supplementary relationships of certain protein concentrates in semi-purified basal diets for growing chickens, A. H. VAN LANDINGHAM, T. B. CLARK, and B. H. SCHNEIDER. (*West Va. Expt. Sta.*). (*Poultry Sci.*, 21 (1942), No. 4, pp. 346-352).—In balance trials with 7-18 6-week-old White Leghorn chickens the protein utilization of protein concentrates fed were practical growing ration 76.2 percent, soybean meal 76, dried whole egg 74.2, casein 58, menhaden fish meal 57, meat scraps 41.9, and corn gluten meal

28.7 percent. There was essentially no supplementary value to the proteins of menhaden fish meal with meat scrap or soybean meal but about 12–18 percent supplementary value was found for corn gluten meal with meat scrap, soybean meal, and menhaden fish meal. Meat scrap and soybean meal showed a similar supplementary value. The study was conducted in individual cages with the birds force fed with each trial consisting of a 3-day preliminary period and a 17-day collection period. Protein utilization was calculated from the nitrogen intake and nitrogen excretion.

Glycine requirement of the chick, H. J. ALMQUIST and E. MECCHI. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 49 (1942), No. 4, pp. 541–543).—When added to the basic diet for the chick used in previous experiments (E. S. R., 86, p. 666), glycine as 1.5 percent produced optimum growth but 2 percent caused a reduced gain. When provided in combinations as in gelatin, edestin, casein, and glycyglycine, 1 percent of glycine gave optimum growth of about 7 percent in weight per day. Two experiments were conducted with supplements of the pure or combined glycine rations with five or six chicks per lot in 10- or 11-day feeding periods.

Green range will provide essential poultry feed to replace that made scarce by war, H. S. WILGUS, JR. (*Colo. Farm Bul.* [Colorado Sta.], 4 (1942), No. 3, pp. 3–4, fig. 1).—Winter rye and wheat followed by oats and later Sudan grass are recommended for growing and breeding flocks of chickens and turkeys and the control of parasites.

Feeding-cane molasses as a constituent of poultry rations.—I, Molasses for growing chickens, W. H. ORT, R. V. BOUCHER, and H. C. KNANDEL. (Pa. Expt. Sta.). (*Poultry Sci.*, 21 (1942), No. 4, pp. 340–345).—In contributing further to studies of cane molasses in the poultry ration (E. S. R., 78, p. 524), two experiments were conducted with about 1,000 chickens fed through the growing period on rations containing 0, 2, 4, and 6 percent of cane molasses. The chicks hatched from the eggs produced the first year were continued to 12 weeks of age on the same rations. The 4-percent cane molasses diet had a slight early growth-stimulating effect on both sexes, but feed efficiency was lowest in the molasses-fed groups. The feed intake per bird was significantly greater for those on the 4- and 6-percent cane molasses rations than when smaller amounts of molasses or no molasses were available.

Absorption and disposition of glucose in the chick, W. R. C. GOLDEN and C. N. H. LONG (*Amer. Jour. Physiol.*, 136 (1942), No. 2, pp. 244–249).—There was an absorption rate from the intestinal tract of about 400 mg. per hour per 100 gm. of body weight for glucose administered in four concentrations to 44 birds and allowed to absorb for 1, 2, 3, or 4 hr. The gastrointestinal tract of the fasted fowl did not contain significant quantities of reducing material, and nearly all of the glucose could be recovered immediately after administration. Twelve percent of the glucose could be accounted for in 4 hr. as increased liver glycogen, but not more than 8 percent was estimated to have been deposited in the muscles. The chick has a relatively intense ability to oxidize glucose or to convert a considerable portion into fat.

Studies in mineral nutrition of laying hens.—II, Excess of calcium in the diet, M. S. GUTOWSKA and R. T. PARKHURST. (Mass. Expt. Sta.). (*Poultry Sci.*, 21 (1942), No. 4, pp. 321–328, figs. 3).—Continuing this series (E. S. R., 87, p. 559), feeding hens all mash rations containing 2.35–3.95 percent calcium with normal phosphorus and ample vitamin D showed that the excessive calcium lowered egg production and feed efficiency. The breaking strength of the eggs was more closely related to the manganese content of the diet than to the calcium levels. The experiment was conducted in two 6-mo. periods

with all mash rations fed to caged Rhode Island Red pullets to which supplements of 2, 4, and 8 percent calcite flour were added. With the ration containing 3.95 percent calcium the percentage egg production was 49.1, as contrasted with 68 percent for those receiving 2.35 percent calcium in the ration. However, there were no significant differences in the average eggshell breaking strength, egg weight, fertility, and hatchability of the eggs from groups receiving varying levels of calcium. The equation of Titus et al. (E. S. R., 77, p. 530) for estimating the calcium requirements of the laying ration was confirmed.

Magnesium requirement of the chick, H. J. ALMQUIST. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 49 (1942), No. 4, pp. 544-545).—The effect on growth of supplementing the purified chick ration (E. S. R., 86, p. 666) with 250, 350, and 450 p. p. m. of magnesium suggested that during the first week of life the chick requires about 400 p. p. m. of magnesium. These studies were conducted with 5 lots of 10 chicks each, reared for 17 days on the ration supplemented as indicated.

The vitamin B₆ requirement of the chick, G. M. BRIGGS, JR., R. C. MILLS, D. M. HEOSTED, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.). (*Poultry Sci.*, 21 (1942), No. 4, pp. 379-383, figs. 2).—Continuing studies of vitamin B₆ in the nutrition of the chick (E. S. R., 83, p. 533) varying levels of vitamin B₆ were fed for about 3 weeks, indicating that the birds needed approximately 275-300 µg. per 100 gm. of the ration for optimum growth. These results were ascertained by determination of the growth of chicks on basal rations and after additions of up to 400 µg. of the crystalline vitamin. Correlations with results obtained with rats and in Jukes' studies with poultry (E. S. R., 82, p. 378) showed close agreement.

Metabolism and food utilization of riboflavin-deficient chicks, M. KLEIBER and T. H. JUKES. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 49 (1942), No. 1, pp. 34-37).—Respiration trials with groups of riboflavin-deficient and adequately supplied chicks showed that riboflavin deficiency decreased the utilization of protein but did not affect the utilization of feed energy beyond decreasing the appetite. The study was conducted with groups of 10 chicks each with and without riboflavin supplements for 10-day periods. For every 100 k calories (100,000 calories) gain in energy the flavin-deficient chicks gained 2.3 ± 0.7 gm. nitrogen, whereas the controls with adequate riboflavin gained 5.1 ± 1.4 gm. Thus they gained protein while losing body fat.

Modifications in the chick vitamin D assay procedure, S. R. JOHNSON. (Ark. Expt. Sta.). (*Poultry Sci.*, 21 (1942), No. 4, pp. 329-332).—Analysis of the right and left tibia of 160 chicks showed the removal of the epiphyseal cartilages to facilitate rapid and complete removal of adhering tissue from the bone. The mean difference between the bone ash in these two cases showed that about 8.5 percent more accurate and complete results were obtained than from the opposite side in which the cartilages were intact. Different vitamin D supplements were included in the rations, and it was found that differences in the ash percentage were usually greater after 3 than after 4 weeks' feeding. The 3-week feeding period was preferred on the basis of the coefficients of variations. A 150 unit level of vitamin D seemed needed for the development of straight keels at 4 weeks of age.

The relation of biotin to perosis in chicks, L. R. RICHARDSON, A. G. HOGAN, and O. N. MILLER (*Missouri Sta. Res. Bul.* 343 (1942), pp. 10).—In a series of experiments lots of White Leghorn chicks receiving rations containing all the known vitamins required by the chick, sucrose and acid-washed and alcohol-extracted casein developed perosis and dermatitis in about 28 days, but they

were largely prevented by feeding 1γ of biotin per day per chick. Injecting intramuscularly or intraperitoneally 2γ-5γ of biotin were required to protect chicks on the raw egg white. The typical dermatitis developed in about 28 days with the perosis in 8-14 days. Several reasons were given to show that the raw egg white possessed a biotin-binding property which was destroyed by heat. It was concluded that biotin is the sole factor concerned in the prevention of dermatitis but an additional factor may be concerned in preventing perosis.

Gizzard erosion in growing chickens, D. MILLER and J. C. HAMMOND. (U. S. D. A.). (*Poultry Sci.*, 21 (1942), No. 4, pp. 317-320).—In order to determine the effect of diets on gizzard erosion at hatching, day-old chicks were killed and scored by methods previously noted (E. S. R., 87, p. 561). The changes were noted in the groups after 7, 13, 28, and 35 days on diets some of which were treated with ethyl ether or supplemented with bile or fortified cod-liver oil. Gizzard erosion in 1-week-old chicks was not very severe regardless of the diet fed, but the gizzard factor which seemed to be labile was removed by treatment with ethyl ether or additions of 2 percent cod-liver oil. Additions of 1 percent desiccated bile reduced gizzard erosion to a very low level at 28 days of age.

Method for relief of crop impaction affecting poultry, G. R. SIPE and H. D. POLK (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 7, p. 7, figs. 2).—A method for relieving crop impaction by the use of water and a suitable device for introducing the water into the crop is proposed. It has been found successful on farms which do not have a water pressure device.

The nature of egg yolk discoloration produced by cottonseed meal, A. D. SWENSEN, E. A. FIEGER, and C. W. UFF. (La. State Univ.). (*Poultry Sci.*, 21 (1942), No. 4, pp. 374-378).—Gossypol was found to be the factor in cottonseed meal responsible for the olive-colored yolks of stored eggs from hens fed cottonseed meal. In feeding experiments lots of two hens were supplied with supplements to a commercial ration of gossypol either in a capsule in wesson oil or in 30 percent cottonseed meal rations. All the eggs from these hens developed a characteristic chocolate color in an ammonia atmosphere and the usual olive-green color in storage, while yolk color was normal in eggs from hens on a standard ration. Normal fresh egg yolk and yolks from hens on a cottonseed meal ration allowed to stand overnight in an ammonia atmosphere developed the same brown color if gossypol were added; otherwise they remained normal. In chemical fraction of the yolk proteins it became evident that the protein decomposed during storage so that the iron was allowed to combine with gossypol and form the olive color. The presence of ferric chloride in the ration prevented the absorption of gossypol by the hens and formation of olive-green yolks on storage.

The effect of alfalfa leaf meal and dried cereal grass on egg production and hatchability, W. W. CRAVENS, C. E. HOLMES, J. G. HALPIN, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Poultry Sci.*, 21 (1942), No. 4, pp. 301-305, figs. 2).—Rations composed largely of grains and grain byproducts supplemented with minerals and proteins resulted in a deficiency in the hatchability of eggs produced in three experiments. The deficient factors were supplied by alfalfa leaf meal and to a lesser extent by dried cereal grass. The results were not greatly improved by supplementing the rations with riboflavin and manganese. The three experiments supplemented the studies of vitamin K in alfalfa meal and dried cereal grass previously noted (E. S. R., 85, p. 807). The studies were conducted with additions of 0.8 to 4 percent of these materials to basal rations in 10-20 White Leghorn pullets each from 5 to 6 mo. of age in different seasons. No significant difference in egg production was discovered. The pronounced

slump in hatchability occurring in the fall and early winter was prevented by 2 percent of alfalfa meal added to the ration, but no increase was produced in hatchability by additions of riboflavin.

Changes in the form of inositol during incubation of eggs, D. W. WOOLLEY (*Soc. Expt. Biol. and Med. Proc.*, 49 (1942), No. 4, pp. 540-541).—Studies of the free and total inositol content of eggs during incubation showed that the total content did not increase, but the proportion in the free form rose from 0.046 µg. per milligram in the fresh egg to 0.19 in the egg after 20 days' incubation.

Farm refrigeration preserves egg quality, R. J. EVANS and J. S. CAEVER. (Wash. Expt. Sta.). (*U. S. Egg and Poultry Mag.*, 48 (1942), No. 6, pp. 341-344, fig. 1).—Determination of the albumen index of new laid eggs showed a temperature of 40° F. to be better for storage and in the preservation of quality than 56° F. There was also sweating of eggs held at lower temperatures. A decrease in the humidity at higher temperatures increased the evaporation and produced a larger air cell. The study was conducted with fresh collected eggs from 176 pullets and stored at 40°, 57°, and 76° F. with variation in the humidity and the storage conditions.

Egg-laying of ducks as an enforced relaxation oscillation, H. KALMUS (*Nature [London]*, 148 (1941), No. 3760, pp. 626-627, fig. 1).—Hens' eggs build up gradually the energy content but are expelled suddenly at a rather constant weight. On the other hand ducks may deposit eggs of variable size at rather constant intervals, sometimes daily, for months. Under such conditions there are gradual decreases in the egg size so that the last eggs of clutches are frequently considerably lighter than the first eggs of a clutch. In nature brooding gives opportunity to build up the size of the eggs in new clutches.

An observation on the feeding of cut grass to goslings, M. M. WEIGER (*Harper Adams Util. Poultry Jour.*, 27 (1942), No. 6, p. 117).—The provision of cut grass as a sole feed to two groups of four goslings was insufficient to promote normal growth, although earlier experiments² have demonstrated that on free range without supplementary feed goslings may make good growth.

The effect of temperature on the hatchability of turkey eggs, G. P. GOON-EAL (*North Dakota Sta. Bul.* 317 (1942), pp. 17, figs. 3).—Hatching results over a 6-yr. period with turkey eggs varying the temperature from 100° to 105° F. for the incubation period showed that in general the best hatching results were secured with temperatures of 102° in a still air incubator. The hatching was definitely lowered above this temperature and the time of hatching was delayed with lower temperatures. It is also noted that greater amounts of evaporation accompanied higher temperatures. It appeared that the incubation temperature for turkey eggs should be 1° lower than for chicken eggs. In a 3 yr. comparison of 98° and 99° in a forced draft incubator a higher hatchability was obtained at 99°

DAIRY FARMING—DAIRYING

The principles of dairying, H. F. JUDKINS, revised by M. J. MACK (*New York: John Wiley & Sons; London: Chapman & Hall*, 1941, 3. ed., rev., pp. XVII+315, pl. 1, figs. 92).—The third edition (E. S. R., 65, p. 865) of this well-known text is noted.

[Experiments in dairying in Arizona] (*Arizona Sta. Rpt.* 1941, pp. 50-54).—Studies for which results are presented include: Normal growth of dairy cattle, the yield and composition of barley and Sudan grass pastures, a comparison of alfalfa silage v. Atlas sorgo silage for dairy cows, the efficiency of

² Harper Adams Util. Poultry Jour., 26 (1941), No. 4, pp. 81-83.

various methods of cleaning milking machines, factors affecting the solids-not-fat content of milk, and a comparison of the Babcock test v. the Mojonnier test for determining the fat content of homogenized milk.

[Dairy investigations in Florida] (*Florida Sta. Rpt. 1941, pp. 60, 62-63, 65, 70*).—Studies, for which results are presented by R. B. Becker, P. T. D. Arnold, D. A. Sanders, L. L. Rusoff, T. R. Freeman, and E. L. Fouts, include the adequacy of the calcium and phosphorus supply in local dairy rations, the value of Napier grass as a pasture for dairy cows, the vitamin A content of milk as affected by varying levels of shark-liver oil in the ration, and the stability of milk toward oxidized flavor development and methods of storing frozen cream.

[Dairy investigations in Kentucky] (*Kentucky Sta. Rpt. 1941, pp. 22-23, 26*).—Results are noted on continuous v. rotational grazing of bluegrass pastures with dairy heifers and the merits of various criteria for determining the quality of farm cream.

[Experiments with dairy cattle and dairy products in Massachusetts] (*Massachusetts Sta. Bul. 388 (1942), pp. 18-19, 43-47*).—Progress reports (E. S. R., 85, p. 809) presented herein include the influence of the level of manganese intake by cows on the manganese content of their milk (E. S. R., 86, p. 237) and a comparison of molasses-grass silage, phosphoric acid-grass silage, and corn silage, with particular reference to their influence on milk flavors, both by J. G. Archibald and C. H. Parsons; the use of urea as a partial substitute for protein in dairy cattle rations, by Archibald; studies on chocolate-flavored milk including the significance of tannic substances and theobromine in chocolate milk, the effect of cocoa on the vitamin C content of milk, and the effect of cocoa on the coagulation of milk, all by W. S. Mueller, and the effect of the Electropure method of pasteurization on chocolate milk, by Mueller and A. M. Shipley; the effectiveness of oat flour and cocoa flour in preventing oxidized flavor defect in milk, ice cream, and fruit sherbets, by Mueller and M. J. Mack; the use of corn sirup solids in ice creams and ices, by Mack and J. H. Nair (E. S. R., 86, p. 525); the value of new stabilizing materials for ice cream, by Mack and Shipley; factors affecting the appearance of melted ice cream, by Mack; a comparison of the electric flash method v. the conventional vat method of pasteurization, by Lipman, J. H. Frandsen, and H. G. Lindquist; and efficiency of the cream separator in standardizing milk, by Shipley and Frandsen.

Dairying in New York State vs. dairying in Cuba and Mexico, R. S. BREED (*Farm Res. [New York State Sta.], 8 (1942), No. 3, pp. 12-13, figs. 2*).—A discussion of present-day dairying in Mexico and Cuba, based on observations by the author during a recent visit to these countries.

*[Dairy cattle investigations in Wyoming] (*Wyoming Sta. Rpt. 1941, pp. 9-10, 29*).—Results are briefly presented for studies by H. S. Willard on the value of steamed bonemeal, cottonseed meal, and molasses as supplements for native hay and dried beet pulp for growing heifers; the relative merits of native upland pasture and irrigated sweetclover pasture for heifers; the increase in milk production resulting from the feeding of grain during the prelactation period; closed barns v. open sheds for milking cows; and the use of skim milk powder and cottonseed meal as a substitute for skim milk in raising calves.

Feeding for milk production, I. R. JONES and R. W. MOESE (*Oregon Sta. Bul. 398 (1941), pp. 47, figs. 9*).—A practical handbook on dairy cattle feeding.

The relation of grain feeding to milk production, A. A. BORLAND, A. L. BEAM, and P. D. JONES (*Pennsylvania Sta. Bul. 424 (1942), pp. [1]+10, figs. 2*).—Based on a total of 66 yearly milk production records with Holstein and Brown Swiss cows fed, in addition to hay and silage, grain at levels ranging from 70 percent of the Haecker standard for milk production to an unlimited amount,

it is concluded that an increase in the grain allowance of cows up to the limit of their capacity will result in a marked increase in milk production, and under careful management was accompanied by no injurious results to the animals. The law of diminishing returns was found to operate with increasing allowances of grain, since increments of grain at the higher feeding levels gave continuously decreasing yields of milk per unit of grain, hence the feed cost of milk production gradually increased with increased allowances of grain. On the basis of prices of feed and milk prevailing in Pennsylvania in March 1942, feeding grain according to the Haecker standard for milk production gave the greatest returns over cost of feed. A reference table indicating the most profitable allowance of grain per cow with varying relationships between the price of milk and the price of grain is presented.

Measuring the yield of nutrients of experimental pastures: A comparison of the results obtained by grazing dairy cattle with those estimated from the yields of grass clipped from plots, R. E. HOBASON, J. C. KNOTT, V. L. MILLER, and F. B. WOLBERG. (Coop. West. Wash. Expt. Sta. and U. S. D. A.). (*Washington Sta. Bul. 411 (1942), pp. 31, fig. 1*).—Trials were conducted over five consecutive seasons comparing the estimated yield from pastures by clippings v. that secured by actual grazing with milking cows. Four or five separate tests were made each year. Uniform height clippings were made from 20 protected areas and 20 grazed areas at the end of each grazing period, with the difference in yield from the protected and grazed areas considered as the amount actually consumed. Chemical analyses and digestion trials on the clipped herbage were used as the basis for estimating the actual amount of digestible nutrients consumed. In the grazing trials, the nutrients secured from pasture were estimated by calculating the total nutritive requirements of the cows for maintenance, live weight change, and milk production and deducting from this the amount of nutrients supplied by supplementary feed. Over the 5 yr., the amount of nutrients from pasture as estimated from the clippings was 108.3, 90.9, 144.4, 132.8, and 154.4 percent, respectively (mean 127.0 percent), of those secured in the grazing trials. Conditions which may affect the accuracy of estimated yield by clipping are discussed.

It is concluded that the clipping of representative areas for the purpose of determining chemical composition and digestibility of the herbage is a desirable adjunct to pasture experiments with dairy cattle, but that yields can be accurately determined only by grazing tests.

The conservation of nutrients in grass silage, IV, J. A. NEWLANDER, H. B. ELLENBERGER, and C. H. JONES (*Vermont Sta. Bul. 485 (1942), pp. 11*).—Continuing this series of investigations (E. S. R., 83, p. 667), first and second cuttings of timothy and mixed grasses were ensiled in small wooden silos with 2 to 3 percent of molasses added as a preservative. The average total loss of dry matter in the four lots of silage was 24.2 percent, attributed in part to the small size of the silos. In all cases the edible silage was of good quality as judged by appearance, odor, palatability, and digestibility. The silages compared closely with early-cut hay in digestibility and in total digestible nutrient content. Hays cut in mid-July and in early August contained 48.6 and 23.2 percent as much digestible crude protein and 91.8 and 79.4 percent as much total digestible nutrient, respectively, as the early-cut hay. Practical suggestions are offered for ensiling grasses and legumes without the use of preservatives.

The digestibility by dairy cows of a grass silage, P. D. SEARS and F. B. SELL (*New Zeal. Jour. Sci. and Technol.*, 23 (1941), No. 1A, pp. 50A-56A).—Herbage from a highly fertile pasture was ensiled in a pit silo, with the addition of 30 lb. of molasses per ton of green material. Digestion experiments with four cows (two Jerseys and two Holsteins) gave the following coefficients of digestibility:

Dry matter 64.8, organic matter 68.4, crude protein 50.1, crude fiber 78.7, ether extract 73.8, and nitrogen-free extract 64.8. Breed, size, and level of production of the cows had no apparent effect on their digestive ability.

The relation of plane of nutrition to milk production and milk composition in New Zealand.—I, II, Effect of subnormal feeding, W. RIDDER, I. L. CAMPBELL, F. H. McDOWALL, and G. A. COX (*New Zeal. Jour. Sci. and Technol.*, 23 (1941), No. 2A, pp. 80A-98A, figs. 4; pp. 99A-112A, figs. 5).—The results of two series of trials are reported.

Three groups of cows all in early stages of lactation were fed over a 90-day experimental period as follows: (1) Continuously on a normal plane of nutrition, and (2) and (3) alternately fed a normal ration and a one-half-normal ration for 30-day periods under a double reversal plan. The changing of groups (2) and (3) from full to half rations caused a reduction in yield, although the decrease was less than expected. It had no consistent influence on the fat content of the milk, but caused a consistent decrease ranging from 0.3 to 0.5 percent in the solids-not-fat content and also an increase in the iodine number and saponification value of the fat. Both the solids-not-fat content and the characteristics of the butterfat returned to normal when full feeding was resumed.

The second series was essentially a duplication of the first except that the cows were in advanced stages of lactation. The results paralleled those for the first trial in all respects. It appeared that the seasonal decline in solids-not-fat in milk may be due to subnormal nutrition. This effect was not altered by the stage of lactation of the animal.

Carotene content of the blood plasma of dairy cattle in relation to vitamin A deficiency. W. D. GALLUP and A. H. KUHLMAN. (*Okla. Expt. Sta.*). (*Okla. Acad. Sci. Proc.*, 21 (1941), pp. 89-92).—Periodic determination of the plasma carotene level of groups of cows receiving prairie hay as their major source of carotene gave evidence that those on a full hay ration varied from 250 to 479 $\mu\text{g.}$ of carotene per 100 cc. of plasma, those on a 50-percent normal hay intake from 179 to 201 $\mu\text{g.}$, and those on a 25-percent normal level from 80 to 167 $\mu\text{g.}$ Cows whose plasma carotene during the last 90 days before calving averaged less than 150 $\mu\text{g.}$ per 100 cc. were generally in poor condition after calving, and many of the calves were weak and failed to survive. Apparently this level of plasma carotene indicates a border-line deficiency of vitamin A.

The effect of a high vitamin A intake on the blood and milk carotene of Holstein and Guernsey cows. H. J. DEUEL, Jr., L. F. HALLMAN, C. JOHNSTON, and F. MATTSO (*Jour. Nutr.*, 23 (1942), No. 6, pp. 567-579, fig. 1).—Continuing this investigation (E. S. R., 86, p. 522), the addition of shark-liver oil to the rations of Guernsey and Holstein cows at levels supplying from 700,000 to 4,200,000 International Units of vitamin A daily resulted in an increase in the vitamin A content of the milk at a rate of approximately 47 units per gram of butterfat for each 1,000,000 units fed. The maximum amount of vitamin A attained was 331 I. U. per gram of butterfat. The efficiency in secretion of ingested vitamin A was about 3 percent. The increase in vitamin A was accompanied by a decrease in milk carotene and a concomitant drop in blood carotene until 2,100,000 I. U. of vitamin A were ingested; but little drop in carotene occurred above this level. A proportionality was found to exist between the levels of carotene in the blood and in the milk. The slope of the curve was similar for Guernseys and Holsteins, although the latter breed was at a much lower level.

Milk yields and milking rates of the individual quarters of the dairy cow udder. C. A. MATTHEWS, W. W. SWETT, and R. R. GRAVES (*U. S. Dept. Agr., Tech. Bul.* 827 (1941), pp. 32, fig. 1).—Data obtained on the rate of milking and the amount of milk produced by individual quarters of 94 cows milked by

machine are summarized. On the average 29.2 percent of the total milk was yielded by the left rear quarter, 20.2 by the left front, 21.6 by the right front, and 29.0 by the right rear quarter. Among this number 21.3 percent of the left and 28.7 percent of the right front quarters yielded over 25 percent of the total, while 26.6 percent of the left rear and 25.5 percent of the right rear quarters yielded less than 25 percent of the total. The relative milk yields from the separate quarters of individual cows varied little from day to day or from morning milkings with higher yields to evening milkings with lower yields, but there was some variation in this respect from the third to the sixth month of lactation and a greater change from one lactation to another. The average total milking time was 8.28 min., of which 1.42 min. was devoted to massaging the udder at the end of milking which took the place of stripping. At 2.5, 5.0, and 7.5 min. after the start of milking 49.9, 81.1, and 92.8 percent of the total yield from the front quarters and 43.1, 76.2, and 91.2 percent of the total yield from the rear quarters had been obtained. Variations in the rate of milking were greater between cows than between individual quarters of the same udder. As milk production declined with advance of lactation, the decrease in milking rate was nearly in the same proportion as the decrease in yields. Many other interesting relationships are discussed.

Machine milking put on a time schedule, A. C. DAHLBERG (*Farm Res. [New York State Sta.]*, 8 (1942), No. 3, p. 6).—A résumé of research previously noted (*E. S. R.*, 85, p. 393).

Artificial induction of lactation in virgin animals, S. J. FOLLEY and F. G. YOUNG (*Nature [London]*, 148 (1941), No. 3758, pp. 563-564, fig. 1).—Two virgin goats which previously had been brought into artificial lactation by the application of diethylstilboestrol ointment to the udder were again stimulated to secrete milk by applying to the udder three times weekly 1 gm. of 1-percent diethylstilboestrol ointment. After milk secretion by this method had reached its peak, subcutaneous injection on alternate days of 5 cc. of an alkaline extract of ox anterior pituitary stimulated further secretion, the total yield reaching 870 cc. per day in one case and 1,700 cc. in the other. Analyses showed that the milk secreted by both goats was normal in composition. It appeared that under suitable conditions artificial lactation so evoked may approach that normally following parturition.

Growth of the male guinea pig mammary gland with diethylstilbestrol, A. A. LEWIS and C. W. TURNER. (Mo. Expt. Sta.). (*Endocrinology*, 30 (1942), No. 4, pp. 585-590, figs. 10).—Normal male guinea pigs were injected daily subcutaneously with diethylstilboestrol (dissolved in oil) at seven levels ranging from 0.01 to 50 μ g. per day over a period of 20 days. At levels of 0.1 μ g. or above, some extension of the mammary gland occurred, with lobule development being observed in all cases showing duct extension. However, no obvious signs of main duct growth were apparent. The teats of all animals receiving 0.1 μ g. or more were larger than those of the controls.

Rôle of estrogen in the stimulation of mammary-lobule-alveolar growth by progesterone and by the mammogenic lobule-alveolar growth factor of the anterior pituitary, J. P. MIXNER and C. W. TURNER. (Mo. Expt. Sta.). (*Endocrinology*, 30 (1942), No. 4, pp. 591-597).—Employing the assay technic previously described (*E. S. R.*, 86, p. 671), progesterone and oestrone were administered simultaneously at various levels. While the range in the amount of oestrone which would best synergize with 1 mg. of progesterone in stimulating mammary lobule-alveolar growth was quite wide, approximately 100 International Units of oestrone were optimal. When progesterone was injected alone approximately six times as much was required to secure the same degree of alveolar growth as when oestrone was simultaneously injected. Similarly,

oestrone enhanced the ability of pituitary materials in stimulating such alveolar growth. Oestradiol benzoate or diethylstilboestrol could be substituted for oestrone as a synergist with progesterone in stimulating lobule-alveolar growth.

A controlled attempt to restore fertility in dairy cattle by treatment with gonadic and gonadotropic hormones. S. A. ASDELL, M. G. FINCHER, S. E. SMITH, and F. I. ELLIOTT ([*New York*] *Cornell Sta. Mem.* 243 (1942), pp. 27).—As experimental subjects in this extensive study, 47 cows with a history of difficult breeding or infertility were assembled and divided into two comparable groups. The cows in the experimental group were injected with from 20,000 to 30,000 rat units of oestrogen, and when conception did not follow anterior pituitary extract was then injected. In the control group 50 percent of the cows conceived and delivered calves, as against 43 percent in the experimental group. There was no apparent relationship between age and percentage of conception. In a search for changes in the blood which might be associated with sterility, hemoglobin, glucose, calcium, inorganic phosphorus, lipid phosphorus, and cholesterol in the blood of sterile cows were found to be within the normal range of variation. Acidity of the vagina was encountered in only one case, suggesting that this condition is seldom the cause of sterility.

Supplementing the controlled experiments, field trials were carried on in two commercial herds. In one, which had been under close veterinary supervision, 17 sterile cows were treated with gonadic or gonadotropic hormones, of which 29.4 percent conceived. In the other herd, which had been under less close supervision, 17 animals were similarly treated, of which 88.2 percent conceived, but abortions reduced the calf crop to 58.8 percent of the cows treated. The high spontaneous recovery in the control group emphasizes the need for exact care in the planning and interpretation of experiments conducted to test methods for the restoration of fertility which has become impaired.

List of sires proved in dairy herd improvement association, 1942 (*U. S. Dept. Agr., Misc. Pub.* 487 (1942), pp. 143).—This publication, the sixth of the series (*U. S. R.*, 86, p. 235), contains the names and summarized records of 1,850 sires whose records were tabulated between April 1, 1941, and January 1, 1942.

Electrocardiograph studies in normal dairy cattle. B. V. ALFREDSON and J. F. SYKES. (Mich. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], 65 (1942), No. 2, pp. 11–37, figs. 5).—Using the Hindle No. 2 model of the Einthoven electrocardiograph with three standard leads, three serial electrocardiograms, taken about 1 mo. apart, were obtained on 97 normal dairy cattle ranging in age from 5 mo. to 12 yr. The heart rate for all individuals averaged 71.6 beats per minute. For those under 1.5 yr. of age the average rate was 82.5, and for those over 1.5 yr. 67.8. The waves in heart beats are expressed in the P, Q, R, S, T form commonly used for human subjects. The form and occurrence of the various deflections are discussed. The duration of the PR interval ranged from 0.10 to 0.30 sec., averaging 0.19; the QRS interval averaged 0.09 sec., and the QT interval 0.39 sec. The duration of QT and, to a lesser extent, of PR was inversely proportional to heart rate. The interval length for the bovine was quite similar to that of the human beings, but in all other respects there was little resemblance between the two. Variations in interval length and in the form and potential of the various deflections occurred much more frequently in the bovine than in the human electrocardiogram, which renders it of doubtful value for diagnostic purposes.

The microflora of milk drawn aseptically from Utah cows. L. W. JONES and K. R. STEVENS. (Utah State Agr. Col.). (*Utah Acad. Sci., Arts, and Letters, Proc.*, 18 (1941), p. 9).—Milk obtained from each quarter of the udder of 10 cows over a 4-mo. period was found to contain an average of 239 bacteria per cubic centimeter, with a range of from 49 to 511. The number of bacteria

in milk from an individual cow was quite consistent from day to day. It is concluded that the udder contamination from healthy cows is a negligible factor in producing milk of low bacterial count. Approximately two-thirds of the organisms appearing on the plates were cocci and one-third rods, which finding corresponds closely with results obtained in other sections of the country.

The bacterial content of goat milk, C. S. BRYAN. (Mich. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 6, pp. 92-95).—Of 380 goats in 15 herds which were examined 2.3 percent had streptococcal mastitis, 1.3 percent staphylococcal mastitis, and 0.5 percent noninfectious mastitis. Of the noninfected animals, 97.5 percent gave milk of class 1 methylene blue quality and 94 percent of class 1 resazurin quality, while only 4 percent gave milk containing over 1,000 bacteria per cubic centimeter.

Fluorescent bacteria in dairy products, E. R. GARRISON and B. W. HAMMER. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 16 (1942), No. 3, pp. 363-377).—Employing various enrichment procedures as described, cultures of fluorescent bacteria were isolated from samples of milk, cream, ice cream, butter, water, feed, soil, and manure, indicating a wide distribution. All cultures studied (496) were Gram-negative, non-spore-forming rods with polar flagellation, which grew well on common media and were psychrophilic. They could be divided into six different classes based on changes produced in litmus milk at 21° C. Many were capable of proteolysis and lipolysis, resulting in flavor defects in milk and butter. Of 52 selected cultures which were inoculated into butters, 90.4 percent produced flavor defects in uncultured, unsalted butter held for 7 days at 21°; 69.2 percent in cultured, unsalted butter; and 48.1 percent in cultured, salted butter. Putrid and rancid flavors were especially common among the off-flavors produced. Of 113 samples of fresh sweet-cream butter examined, about one-third yielded fluorescent bacteria. Off-flavor development was more prevalent in butters containing such organisms than in those free from them.

Mastitis and the plate count of milk.—II, The influence of *Streptococcus agalactiae* mastitis upon the standard plate count of milk, M. E. MORGAN, E. O. ANDERSON, and W. N. PLASTRIDGE. (Univ. Conn.) (*Jour. Milk Technol.*, 5 (1942), No. 2, pp. 67-76, fig. 1).—Continuing this series (E. S. R., 87, p. 106), composite samples of milk were taken from each of 93 dairy herds, all of which were known to have harbored animals affected with *S. agalactiae* mastitis prior to the time of this study. These were plated in 3 dilutions on old and new standard medium and on Edwards medium. Total colony counts on new standard medium ranged from 1,270 to 4,330,000 per cubic centimeter. Seventy-eight of the 93 gave β -hemolytic *S. agalactiae* counts on Edwards medium, with a range from 7 to 217,000 per cubic centimeter. The contribution of *S. agalactiae* to the total number ranged from 0 to 48.03 percent. For each 1-percent increase in the incidence of infected quarters in these herds, there was an increase of 58.85 ± 8.05 in *S. agalactiae* count. There was no correlation between total counts and the number of *S. agalactiae* present. Apparently *S. agalactiae* mastitis may be responsible for a large proportion of the standard plate count on low count milk, but will contribute only a very small percentage of the total number of bacteria in high count milk.

Study of a ropy milk organism, L. Ó. DROMA and M. GRIMES ([*Irish Free State*] *Dept. Agr. Jour.*, 38 (1941), No. 1, pp. 68-73).—This study identified *Micrococcus pituitoparus* as the primary cause of ropy fermentation of milk. Morphological, cultural, and biochemical characteristics of the organism are described, and methods for its control and elimination are suggested.

Cryophilic bacteria as a cause of milk samples failing the methylene blue test, C. S. MORRIS (*Dairy Indus.*, 7 (1942), No. 3, pp. 63-64, 69).—Numerous samples of milk were encountered in which bacterial number increased practically

as rapidly at an incubation temperature of 4° C. as at atmospheric temperature. Milk when held overnight at low temperature generally had a high colony count and a short methylene blue reduction time. Isolated cultures of the cryophilic bacteria proved to be of the pseudomonas types. Checks on farms producing such milk indicated that water supplies were the chief source of contamination, and that such trouble could be controlled by thorough sterilization of milk cans and dairy utensils.

The bacterial population of paper milk containers in relation to methods of moisture proofing. J. W. RICE (*New York State Sta. Tech. Bul.* 263 (1942), pp. 29, pls. 4, fig. 1).—Experimental lots of square-type paper milk containers, fabricated in the usual manner, were waxed with paraffins having melting points of 123°–125°, 125°–127°, 128°–130°, and 133°–135° F., each used at waxing bath temperatures of 150°, 160°, 170°, and 185°. The containers were then packed in cartons of 100 each, and these were sealed for transportation and delivered to the laboratory. Broth sterility tests on one-half of the containers from each run showed approximately 80 percent of them to be sterile, with no significant difference in the percentage of sterility among the several sets. The plating of sterile water rinses from representative containers of each set revealed approximately 60 percent sterility, again with no significant difference between sets. Only a few containers yielded more than five colonies per container. Most effective moisture proofing, as indicated by the degree of penetration of methylene blue dye into the walls, corners, and seams of the container, was obtained by treating the paper with wax of a melting point of 133°–135° applied at 150°.

Public health compliance by manufacture of paper for packing perishable foods. J. R. SANBORN. (N. Y. State Expt. Sta.). (*Jour. Milk Technol.*, 5 (1942), No. 2, pp. 88–93).—Based on numerous bacteriological analyses of paper-board materials at various stages in the manufacturing process and on the finished product, it is the author's opinion that the manufacturers in general are complying with public health requirements. Substantiating data are presented.

Development of oxidized flavor and the speed of oxidation of ascorbic acid in milk. G. H. HARTMAN and O. F. GARRETT. (N. J. Expt. Stas.). (*Jour. Milk Technol.*, 5 (1942), No. 2, pp. 86–87).—Data are presented on seven samples of milk examined while fresh and after 24, 48, and 72 hours' storage. One sample, which passed through a worn bronze pump, developed pronounced oxidized flavor and was relatively very low in ascorbic acid content at the end of 72 hr. Among the other six, which were similarly handled except that they were passed through a stainless steel pump, the three which developed slight oxidized flavor were lower in ascorbic acid content than the remaining three which showed no trace of this flavor.

How methods and promptness of cooling affects the quality of milk, with suggestions for producing high quality milk. A. J. GELPI, C. S. McCLESKEY, and D. M. SEATH (*Louisiana Sta. Bul.* 344 (1942), pp. 15, figs. 4).—Comparing various methods of milk cooling, it was found that milk cooled in cans from 33° to 40° F. by submergence in agitated cooling medium contained more bacteria than milk chilled to a comparable temperature by passing it over tubular or conical coolers. A delay of 2 hr. in cooling did not materially affect the quality of milk rapidly chilled over surface coolers during a subsequent holding period of 12 hr. at 40°. A similar delay for milk cooled in cans resulted in a significant increase in bacterial count during such a holding period. The method of cooling did not appreciably affect milk flavor. A practical procedure for producing high-quality milk is outlined.

"Smothered" milk. G. M. TROUT, C. S. BRYAN, and R. E. HOWWOOD (*Michigan Sta. Quart. Bul.*, 24 (1942), No. 4, pp. 342–353).—Milk produced under sanitary

conditions from individual cows failed to show a smothered flavor when cooled at once in clean cans either tightly covered or uncovered or when cooled after standing for 1 hr. in a tightly closed container. The flavor score varied more between individual cows than as a result of the method of cooling. The odor of milk in old milk-stoned cans was predominantly old, musty, or stale, due to the condition of the can, but these odors could not be discerned in the milks when samples taken in glass from such cans were scored separately. No significant difference in bacterial count was obtained in milk cooled in new cans or in old milk-stoned cans when sampled fresh or after overnight storage in the cans at 40° F. when all the cans were sanitized by a rotary washer and wet-steam sterilizer. It is concluded that "milk sanitarily produced in a well-ventilated stable from healthy cows under proper feeding management may be safely cooled in a closed container without resulting in the so-called smothered flavor."

Formalin adulteration in milk and its detection in the resulting butter, G. T. PYNE and J. LYONS (*Irish Free State*] *Dept. Agr. Jour.*, 38 (1941), No. 1, pp. 74-76).—Attempts were made to detect the presence of formaldehyde in butter churned from creams which contained from 2 to 50 p. p. m. of this compound by means of the Shrewsbury-Knapp test. Butter initially containing 2 p. p. m. of formaldehyde failed to give a positive reaction for its presence after from 3 to 4 days of storage, while an initial content of 5 p. p. m. was detectable after 3 months' and 15 p. p. m. after 6 months' storage.

Reducing the loss of fat during churning, G. H. WILSTER, R. P. ROBICHAUX, R. E. STOUT, and R. W. STEIN (*Oregon Sta. Bul.* 397 (1941), pp. 36).—This study covered the fat losses in the buttermilk from the churning of 2,141 lots of cream. Determining the percentage of total fat churned lost in the buttermilk was found to be the only practical way of comparing the fat losses. The Babcock-butyl alcohol test, as described, proved satisfactory for this purpose. In a large number of churnings of vat-pasteurized cream, fat losses in the buttermilk ranged from 0.44 to 3.2 percent, with weighted averages in four series amounting to 0.92, 1.06, 1.16, and 1.22 percent, respectively. One series of churnings from flash-pasteurized cream showed an average loss of 1.32 percent. Fat losses in buttermilk tended to be higher in summer than in winter, in the churning of low-fat cream than in high-fat cream, and in churning at relatively high than at low temperatures. The exclusion of rinse water from the cream churned also tended to reduce fat lost in the buttermilk. In churning vacuum-pasteurized cream fat losses in the buttermilk ranged from 1.12 to 1.64 percent. Quick cooling of the cream from the Vacreator to at least 50° F. and a final lowering to 40°-45° proved very important in maintaining low fat losses in vacuum-pastuerized cream.

Diacetyl and acetylmethylcarbinol production in the manufacture of unsalted butter, T. I. HEDRICK and B. W. HAMMER (*Iowa Sta. Res. Bul.* 301 (1942), pp. 825-860).—In a series of trials with sweet and neutralized sour creams, both under laboratory and semicommercial conditions, it was found that increasing the acidity, adding small amounts of citric acid to the cream, and agitation of the cream during ripening, all tended to increase both the diacetyl and acetylmethylcarbinol content of the cream. In general, as the diacetyl content increased during ripening acetylmethylcarbinol also increased, although the relationship between them was somewhat variable. The ratio of diacetyl in the cream to that in the resulting butter averaged 1:0.352 (1:0.142 to 1:0.709) and of acetylmethylcarbinol 1:0.217 (1:0.059 to 1:0.683). In comparing the influence of various holding temperatures for unsalted butter on the development of diacetyl and acetylmethylcarbinol in the butter, increases were generally greater

in butter held 3 days at 60° F. plus 4 days at 36°–40° than in that held 1 week at 36°–40°. While both increases and decreases in the content of these compounds in butter were experienced under all holding conditions, the increases were more numerous than the decreases.

A study of the quality of retail butter in Michigan, I. A. GOULD (*Michigan Sta. Quart. Bul.*, 24 (1942), No. 4, pp. 298–304).—Examination of 153 samples of butter obtained at random in retail stores in four different markets revealed about one-half as poor in flavor, one-third poor in extraneous matter, two-thirds poor in yeast and mold count, one-sixth poor in mold mycella, and about two-fifths poor in composition. No definite relationship could be established between flavor and price or between claims on the package as to quality and the flavor. These findings are held to indicate the desirability of establishing a butter-grading system as a means of protecting the consumer, since at present the consumer has no reliable means of ascertaining the quality of butter which is available for purchase.

The manufacture of Cornhusker cheese, E. L. REICHART and P. A. DOWNS (*Nebraska Sta. Bul.* 342 (1942), pp. 13, figs. 13).—The cheese described is somewhat softer in texture and milder in flavor than typical American Cheddar. The method of manufacture, which is described in detail, differs in only a few respects from that employed in Cheddar cheese manufacture and requires essentially the same equipment. The cheese is produced in 5-lb. hoops and is waxed before ripening. Satisfactory ripening may be obtained in 30–60 days at a temperature of 65° F. and a relative humidity of 70–80. At 45° the curing period will vary from 6 to 12 mo. The cured cheese may be held at 32° up to 18 mo. with little change in flavor or texture.

Improved practices aid cheese makers, J. C. MARQUARDT. (N. Y. State Expt. Sta.). (*Food Indus.*, 14 (1942), No. 6, pp. 49–50, fig. 1).—Suggestions are offered on the effective use of chlorine as a sterilizing agent and deodorizer, methods of fly control, precautions for controlling mold in the cheese rooms, and the salt control in cheese.

The progress and present position of research on cheese starters in New Zealand, H. R. WHITEHEAD and G. J. E. HUNTER (*New Zeal. Jour. Sci. and Technol.*, 23 (1941), No. 1A, pp. 40A–46A).—A concise review, tracing research leading up to the finding that infection with air-borne bacteriophage is the main cause of failures of starter cultures (E. S. R., 85, p. 813).

A neglected phase of frozen desserts sanitation, F. W. FABIAN. (Mich. State Col.). (*Jour. Milk Technol.*, 5 (1942), No. 2, pp. 106–110).—A discussion of the role of unpasteurized products, such as flavoring, fruits, and nuts, in ice cream sanitation, with 16 references to the literature.

How to calculate gallon weights of dairy products, A. J. HAHN and P. H. TRACY. (Univ. Ill.). (*Food Indus.*, 14 (1942), No. 6, p. 55).—Simple and accurate methods are presented for computing the weight per gallon of ice cream mixes, condensed milk, and other products.

VETERINARY MEDICINE

Index-catalogue of medical and veterinary zoology.—Part 6, Authors: G to Gyser, A. HASSALL, M. A. DOSS, R. M. TAYLOR, G. B. CARLSON, and D. B. SEGAL (*U. S. Dept. Agr.*, 1942, pp. [1]+1459–1754).—A continuation of this index catalogue (E. S. R., 86, p. 526).

[Work in animal pathology and parasitology by the Arizona Station] (*Arizona Sta. Rpt.* 1941, pp. 44–45).—Report (E. S. R., 85, p. 664) is made of the outbreak of and control work with the stomach worm *Ostertagia ostertagi*,

analysis of a toxic range plant *Monolepis nuttalliana*, and treatment of range cattle for warbles.

[**Work in animal pathology by the Florida Station**] (*Florida Sta. Rpt. 1941*, pp. 58, 61-62, 67, 69).—Brief reports of progress (E. S. R., 85, p. 665) by M. W. Emmel, D. A. Sanders, E. West, and J. T. Creighton include the etiology of fowl paralysis, leukemia, and allied conditions in animals; a study of plants poisonous to livestock in Florida; the influence of sulfur on the body populations of lice in chickens; infectious bovine mastitis; and the diagnosis of (1) "wet wings," a new disease of chickens, and (2) "sod disease," an affection involving the feet of chickens, as due to a fungus infection.

[**Work in animal pathology by the Kentucky Station**] (*Kentucky Sta. Rpt. 1941*, pp. 27-29).—The work of the year (E. S. R., 85, p. 815) reported upon relates to virus abortion of mares, periodic ophthalmia, incoordination in young horses, corynebacteria in domestic animals, and paratyphoid bacilli.

[**Work in animal pathology and parasitology by the Wyoming Station**] (*Wyoming Sta. Rpt. 1941*, pp. 16-20, 22-25, 27-28).—The work of the year (E. S. R., 85, p. 105) reported upon covers soil nitrogen as related to abnormally poisonous properties of forage plants (E. S. R., 84, p. 101), poisoning from *Senecio*, selenium and other minerals which produce poisoning in livestock, feeding tests with *Parmelia molliuscula* (by W. T. Huffman) (coop. U. S. D. A.), calf diphtheria, abortion in ewes (by A. M. Lee), fowl paralysis, and the relation between the parasites of game animals and those of domestic animals (by R. Honess and J. W. Scott).

[**Contributions on animal pathology**] (*Onderstepoort Jour. Vet. Sci. and Anim. Indus.*, 16 (1941), No. 1-2, pp. 9-66, 115-166, 315-328, figs. 27).—Among the contributions presented (E. S. R., 86, p. 382) are the following: The Transmission of Tick-Bite Fever by the [Brown] Dog Tick (*Rhipicephalus sanguineus* Labr.), by W. O. Neitz, R. A. Alexander, and J. H. Mason (pp. 9-17); Studies on the Neurotropic Virus of Horsesickness—VII, Transmitted Immunity, by R. A. Alexander and J. H. Mason (pp. 19-32) (E. S. R., 81, p. 570); The Particle Size of African Horsesickness Virus as Determined by Ultrafiltration and Ultracentrifugation (pp. 33-50) and The Electrophoresis of the Neurotropic Virus of Horsesickness and Its Neutralizing Antibodies in Low Concentration (pp. 51-66), both by A. L. Polson; Description of a Tick, *Rhipicephalus glabroscutatum* sp. nov. (Ixodidae), From the Karroo Areas of the Union of South Africa, by R. du Toit (pp. 115-118); Recent Investigations Into the Toxicity of Known and Unknown Poisonous Plants in the Union of South Africa, XI, by D. G. Steyn and S. J. van der Walt (pp. 121-147) (E. S. R., 86, p. 382); South African *Senecio* Alkaloids—V, Notes on Isatidine, Rosmarinine, and Pterophine and On the Structure of Their Nectines and Nectic Acids, by H. L. de Waal (pp. 149-166); and A Note on the Influence of a Bloodmeal Ration on Porphyrin Excretion in Normal Bovines, by G. C. S. Roets (pp. 315-328).

Some mites injurious to domestic animals and man encountered recently by New York State veterinarians, D. W. BAKER (*Cornell Vet.*, 32 (1942), No. 3, pp. 326-333, figs. 14).—Notes are presented on chorioptic mange of the horse, psoroptic mange (scabies) of the cow, and acariasis (*Liponyssus* spp.) of the fowl, dog, and man.

Urinary calculi, problem in feedlot meat production, largely caused by ration, F. CROSS (*Colo. Farm Bul. [Colorado Sta.]*, 4 (1942), No. 3, pp. 16-17).—Attention is called in this brief practical account to the finding by the Colorado and other stations that a ration deficient in vitamin A will produce the urinary calculi found in livestock. An unbalance of minerals in the diet, thus result-

ing in an abnormal excretion of minerals by the kidney, is no doubt often the cause. Animals that are prevented from consuming, or fail to consume, the usual amount of water over a considerable period of time may excrete a concentrated urine and as a result calculi may form. The ration should in all instances have an ample supply of vitamin A, which is abundant in most green feeds and particularly in bright alfalfa hay, also minerals in amounts sufficient to meet the body requirements.

Milk sickness caused by white snakeroot, E. L. MOSELEY (*Bowling Green: Ohio Acad. Sci. and Author*, 1941, pp. IV+171, [pls. 3]).

Equine encephalomyelitis (western type) in humans in Alberta, 1941, A. C. MCGUGAN (*Canad. Pub. Health Jour.*, 33 (1942), No. 4, pp. 148-151).—An epidemic of equine encephalomyelitis occurred among horses and humans in Alberta during the summer and early fall of 1941, 42 cases having been reported among humans. Blood specimens from 28 of these were received for examination, of which 20 were positive and 8 negative.

Trichinella spiralis.—I, Incidence of infection in man, dogs, and cats in the New Orleans area as determined in postmortem examinations, W. SAWITZ (*Arch. Pathol.*, 28 (1939), No. 1, pp. 11-21, figs. 2).—A survey made in the New Orleans area of the occurrence of trichinosis in man, dogs, and cats is reported upon in this first contribution. The examination of human diaphragms and pectoral muscles obtained in 400 routine unselected necropsies disclosed 24 cases of infection with *T. spiralis* in that area, an incidence of 6 percent. The incidence of infections with this parasite in 300 dogs of this area was found to be 1.3 percent and the incidence in 90 cats to be 10 percent. The incidence in cats is considered to serve as an indicator of the endemicity of *Trichinella* infection in an area.

Trichinella spiralis.—II, Incidence of infection in hogs and rats in the New Orleans area, C. E. PERES (*Jour. Parasitol.*, 28 (1942), No. 3, pp. 223-226).—In continuation of the study above noted, the diaphragms of 516 southern hogs and the loins of 399 midwestern hogs were examined for *Trichinella* infection by the artificial digestion technic. None was found infected, neither was any of 50 samples of sausage from local butchers. Two positives, or 0.4 percent, were detected in 467 rats trapped in the New Orleans area.

[Studies of gramicidin and tyrocidine] (*Jour. Biol. Chem.*, 141 (1941), No. 1, pp. 171-206, figs. 3).—The chemical nature of gramicidin and tyrocidine is reported upon by R. D. Hotchkiss (pp. 171-185), the composition of gramicidin and tyrocidine by H. N. Christensen, R. R. Edwards, and H. D. Piersma (pp. 187-195), and some properties of gramicidin by M. Tishler, J. L. Stokes, N. R. Trenner, and J. B. Conn (pp. 197-206).

Phenothiazine as an anthelmintic, C. E. HOWELL and J. W. BRITTON. (Univ. Calif.). (*Cornell Vet.*, 32 (1942), No. 3, pp. 255-265).—The findings here reported present several new facts concerning dosage, mode of administration, and toxicity of phenothiazine for horses. The work is summarized as follows: "(1) The efficiency of phenothiazine against the horse strongyles is amply confirmed. (2) Under southern California conditions treatment appears to be necessary in the early spring and late summer. (3) It is unwise to worm foals under 9 mo. of age unless *Trichostrongylus axei* is present. (4) The dose rate of phenothiazine is tentatively set at from 25 to 30 gm. per 1,000 lb. (5) Small repeated daily doses (1 to 5 gm.) of phenothiazine, given until the therapeutic dose is reached, are efficient and when given with a tonic are probably less dangerous than single large doses. (6) Brood mares up to the last month of pregnancy and lactating mares have been wormed with no ill effects. (7) An analysis of reported symptoms and autopsies of 650 horses receiving pheno-

thiazine indicates constipation, anemia, and congestion of the kidneys as effects of phenothiazine on horses. The anemia is mild, transient, and recovery is spontaneous. (8) Extreme anemia and emaciation and severe constipation are the only two known contraindications. (9) The source of the drug has little if any effect on its toxicity."

The authors have treated colts with rickets, mares in late pregnancy, mares suckling foals, and moderately anemic horses with no ill effects.

Inhibiting effect of various compounds on curative action of sulfanilamide and sulfapyridine in infected mice, G. W. RAIZISS, M. SEVERAC, and J. C. MOETSCH (*Jour. Amer. Pharm. Assoc.* 31 (1942), No. 7, pp. 198-200, figs. 2).—It was found that the therapeutic effect of sulfapyridine by mouth on mice infected with pneumococcus type II or *Streptococcus hemolyticus* was completely annihilated when *p*-aminobenzoic acid was administered simultaneously. The isomeric *o*-aminobenzoic acid proved to be much less inhibiting. The replacement of the amino group by the hydroxyl, the carboxylic acid by the sulfonic acid group, and the introduction of a third substituent into *p*-aminobenzoic acid resulted in a substantial destruction of the inhibitory effect. Nicotinic acid, cevitic acid, and even to a lesser degree thiamin chloride have only a slight inhibitory effect on sulfapyridine.

A study of drugs affecting the motility of the bovine rumen, R. W. DOUGHERTY. (Oreg. Expt. Sta.). (*Cornell Vet.*, 32 (1942), No. 3, pp. 269-280, figs. 4).—Description is given of a method for recording variations of pressure in the rumen. The action of certain drugs on rumen motility is described.

The udder infusion treatments in a herd program for the control of streptococcal mastitis, C. S. BRYAN and H. H. RUHLAND (*Michigan Sta. Quart. Bul.*, 24 (1942), No. 4, pp. 290-291).—It is pointed out in this practical account that the udder infusion treatments for mastitis involving the use of tyrothricin (gramicidin), novoxil, and acriflavine were reported during the last year to yield recoveries in from 80 to more than 90 percent of the infected cows treated. The recovery is measured by the freedom of the udder from mastitis streptococci. A brief summary is given of the several pertinent facts which the dairyman must understand before the treatment of any cow is commenced in order to insure success of the mastitis control program.

Biopsy of the bovine mammary gland in connection with mastitis studies, W. G. ANDBERG and A. G. KARLSON. (Minn. Expt. Sta.). (*Cornell Vet.*, 32 (1942), No. 3, pp. 237-240, figs. 2).—Description is given of a simple technic for the biopsy of lactating mammary glands by the use of a sharp-edged cork borer. Sulfanilamide was applied locally in the incision to combat possible infection. Very little tissue damage followed, and there was no apparent diminution of the milk production as a result of these biopsies. This technic makes it possible to follow the progress of experimental work without sacrificing the animal.

The changes produced by *Brucella abortus* in the milk and udder of cows infected with Bang's disease, M. S. HOFSTAD (*Cornell Vet.*, 32 (1942), No. 3, pp. 289-294, figs. 4).—This contribution includes a description of the procedure and methods used in the study and the changes produced in the milk and in the udder.

Studies on cowpox.—II, A note on the longevity of vaccinia immunity in cattle, L. E. BOLEY and R. GRAHAM. (Univ. Ill.). (*Cornell Vet.*, 32 (1942), No. 3, pp. 335-336).—Reporting further (E. S. R., 86, p. 580), in a herd of dairy cattle that presented many cases of natural cowpox over a period of years artificial immunity against vaccinia endured for at least 2 yr. in one group of 18 mature cows.

Sporadic bovine encephalomyelitis, I. B. BOUGHTON (*Abstr. in Texas Sta. Cir.* 96 (1942), pp. 20-21).—Reference is made to observations of several cases of a subacute disease of bovines, recorded by McNutt and Waller (*E. S. R.*, 84, p. 528) under the name of sporadic bovine encephalomyelitis as occurring in cattle in Iowa. It is thought to be due to a virus, but the manner of transmission is not known. It occurs during all seasons of the year, and yearly recurrence on the same premises is not the rule. Usually only a few calves in a herd are affected.

Sulfaguanidine in "white scours" of calves, G. H. WISE and G. W. ANDERSON. (*S. C. Expt. Sta.*) (*Jour. Amer. Vet. Med. Assoc.*, 100 (1942), No. 779, p. 160).—Brief report is made of five cases of white scours which recovered as the result of the administration of several doses of sulfaguanidine in aqueous suspension. Two of these cases had received "anti-coli-enteritidis-pasteurella serum" of bovine origin, but this failed to prevent the disease. Chemotherapy in all cases was initiated immediately after the first positive symptoms of white scours were manifested. The dosage per 100 lb. of body weight was reduced from 5 gm. as the initial dose to 3.5 gm. 4 hr. later, 2.5 gm. following an interval of 6 hr., and 2.5 gm. subsequently. The treatment was continued until the diarrhea definitely subsided, which was usually a short time after giving the third dose. However, in one case only one dose was necessary, whereas in another four doses were required. The treated calves remained weak and without appetite for about 2 days following cessation of the diarrhea. In order to provide nourishment to two of the calves during the recuperative period it was necessary to drench them with milk drawn from their respective dams. Within 3 days following the sulfaguanidine treatment no abnormal clinical symptoms were evident. A male calf that had recovered was sacrificed for autopsy, which revealed a slight catarrhal condition of the colon and a small hemorrhagic area in the fundus of the abomasum. Neither of these conditions was considered pathologically serious.

Treatment and prevention of scours—sulfaguanidine, succinyl sulfathiazole, G. H. WISE. (*S. C. Expt. Sta.*) (*Jersey Bul.*, 61 (1942), No. 27, pp. 1012-1013, 1030-1031, fig. 1).—Reporting further (see above) on the control of white scours, it is pointed out that sulfaguanidine is convenient and effective in its treatment. Preliminary observations on the use of succinyl sulfathiazole indicate that this more recently prepared chemical is also an excellent medicament for the treatment of this affection.

On additional antigens in the erythrocytes of cattle, L. C. FERGUSON, C. STORMONT, and M. R. IRWIN. (*Wis. Expt. Sta. coop. U. S. D. A.*) (*Jour. Immunol.*, 44 (1942), No. 2, pp. 147-164).—The authors have detected 30 antigens in the erythrocytes of cattle by means of isoimmune serums produced by transfusing blood from one individual into another or by immunizations of rabbits with bovine cells, or by both methods. Each cellular character appears to be produced by a single gene, although some may be products of linked genes. Since these antigens are passed only directly from parent to offspring, these characters may be used for exclusion in cases of disputed parentage in cattle.

Studies of pathology in cattle produced by liver fluke (*Fasciola hepatica*), D. R. MORRILL and J. N. SHAW (*Oregon Sta. Bul.* 408 (1942), pp. 30, figs. 20).—The loss of livers, flesh, and milk from cattle in the State, where limited observations at an Albany packing plant revealed 20 to 33 percent of the slaughtered cattle more than 2.5 yr. of age to show evidence of fluke presence, led to the investigation here reported. Reference is made to the finding of Krull (*E. S. R.*, 84, p. 394) of an even higher percentage of fluke injury in Utah. The study was conducted with the view to determining the extent of the pathology produced in livers by this trematode, the activity of the parasite within the

liver, and the resulting tissue responses. The observations made as to the effects of this fluke on its bovine host indicate them to be limited to a mild anemia and eosinophilia and slight, if any, lowering of general body condition. The most marked alterations are produced by this parasite in the bile ducts and consist in the sclerosis of lamina propria, muscle wall, and perimuscular connective tissues, a reactionary hyperplasia of the epithelium with an elaboration of a mucin-like substance, the deposition of inorganic salts in the mucosa, and an erosion and necrosis produced by parasites inhabiting them. In naturally infested animals damage incurred in the hepatic parenchyma is relatively slight. When more severe injury is produced by a heavy infestation, it may be offset by compensatory hyperplasia in other parts of the organ. An increase in interlobular connective tissue was frequently observed, especially in proximity to infested ducts.

The thickening of Glisson's capsule, presence of focal subcapsular lesions, and the metaplasia seen in overlying peritoneum are submitted as suggestive histological evidence that the young fluke probably reaches the choleic ducts by migration from the peritoneal cavity through Glisson's capsule and the hepatic parenchyma. The recovery of young flukes from a typical subcapsular lesion of a yearling heifer injected intraperitoneally with 3-day-old flukes further indicates that these parasites reach the liver by this route.

Considering the value of liver tissue as a food and therapeutic agent, the observations reported indicate that special effort should be made under adequate supervision to utilize mildly infested organs that are now discarded without consideration.

Sneezeweed, "fifth columnist" in sheep production, combated by management. C. W. DORAN. (Coop. U. S. D. A.). (*Colo. Farm Bul. [Colorado Sta.]*, 4 (1942), No. 3, pp. 5-7, figs. 3).—A practical discussion of the orange or western sneezeweed [*Helenium (Dugaldia) hoopesii*], a source of serious loss of sheep on many high-altitude summer ranges in western Colorado. It now infests more than 1,500,000 acres of summer range land in the State and is constantly spreading. The plant also occurs in 10 other Western States and particularly in Utah.

Reference is made to a study of two bands of range ewes and lambs in which the death losses, lamb weights, lamb crops, and gross income from the sale of lambs were recorded during three consecutive seasons. Data, presented in table form, show the effects of management and demonstrate conclusively that range infested with poisonous plants can be used most profitably only when sheep are properly handled. When good or improvement management replaced poor management in either of the bands studied, death losses from sneezeweed poisoning were reduced more than 80 percent and from 22,000 to 26,000 more pounds of lamb were produced and marketed, resulting in an increased gross income of from \$2,000 to \$2,400.

A description is given of the management practices found to have a marked effect on decreasing losses and increasing production of sheep on such infested ranges as are recommended.

Earlier work with *H. hoopesii* by Marsh and his associates has been noted (E. S. R., 46, p. 82; 52, p. 480).

"Wobblers" compared with ataxic ("swingback") lambs. P. OLAFSON (*Cornell Vet.*, 32 (1942), No. 3, pp. 301-314, figs. 10).—The author calls attention to the similarity between wobblers and ataxic lambs, both of which occur in young animals reared on limestone soil. The symptoms, lesions, and progress of the diseases in affected animals are much the same. Investigators have shown that the administration of copper to pregnant ewes kept in "swayback" regions markedly decreases ataxia in the lambs. Copper administration should be tried on pregnant mares to see if this would prevent the development of wobblers.

Blood from wobblers and their dams and the livers from wobblers should be analyzed for copper.

Studies of parasites in Oregon sheep on irrigated pastures, J. N. SHAW and O. H. MUTH (*Oregon Sta. Bul.* 402 (1942), pp. 16, figs. 10).—This progress report of a study under way deals with the effect of parasites, particularly the small stomach worm (*Ostertagia circumcincta*) and the small intestinal worm (trichostrongyle) in lambs and old and young ewes on pasture, some of which were treated with phenothiazine. Other helminths found present included the eastern stomach worm (*Haemonchus contortus*), *Strongyloides papillosa*, *Bunostomum trigonocephalum* (hookworm), *Nematodirus filicollis*, *Ohabertia ovina*, *Trichuris ovis*, *Moniezia* sp. (tapeworm), and *Dictyocaulus filaria* (lungworm). The animals were held on pasture plats in 1940 and 1941 with supplements of wheat and barley. Only 8 of 95 lambs became fat in 126 days on irrigated Ladino clover pastures, a death loss of 17 of the lambs having resulted from parasitism. The worm load estimated averaged 7,856 in 14 stomachs and 14,091 in 13 small intestines. The symptoms included extreme loss of weight, scouring, and thirst, no bloat having been observed. Treatment applied after clinical symptoms appeared was unsuccessful.

Observations on the blood-picture of sheep treated with phenothiazine, H. H. HOLMAN and I. H. PATTISON (*Vet. Rec.*, 54 (1942), No. 22, pp. 215-216).—It is concluded that the therapeutic dose of phenothiazine for lambs is from 10 to 20 gm., but no specific change was detected in the blood of 25 lambs receiving more than this dose.

A note on the possible anthelmintic value for sheep of phenothiazine incorporated in feed or lick, H. M. GORDON (*Jour. Council Sci. and Indus. Res. [Austral.]*, 15 (1942), No. 1, pp. 54-55).—It is concluded that until further work has been conducted the administration of phenothiazine in salt licks or in a food supplement cannot be recommended.

Further studies of diseases affecting moose, III, R. FENSTERMACHER and O. W. OLSEN (*Minn. Expt. Sta.*). (*Cornell Vet.*, 32 (1942), No. 3, pp. 241-254).—This third contribution reports upon the examination and study of five additional animals (*E. S. R.*, 77, p. 544). One of the animals, a young male, was affected with brucellosis, and a second died as the result of an extremely heavy infestation of liver flukes (*Fascioloides magna*). There was no evidence of extensive encephalitis in any of the five animals, but it is pointed out that the idea or possibility of a neurotropic virus as a factor has not been abandoned.

Studies on feeding zinc to pigs, J. SAMPSON, R. GRAHAM, and H. R. HESTER (*Univ. Ill.*). (*Cornell Vet.*, 32 (1942), No. 3, pp. 225-236, figs. 8).—Following a brief review of the results of studies of other investigators which seem to warrant the conclusion that the body probably has a specific need for zinc and can tolerate a reasonably larger intake than the normal requirement, although the consumption of a large amount for an extended period may possibly prove harmful, the results of an investigation undertaken at the Illinois Experiment Station in 1937 are reported. Shoats weighing from 75 to 100 lb. and weanling pigs were fed zinc lactate. Lameness and arthritis occurred in the smaller pigs, but no ill effects were observed in the larger animals. The results obtained in the trial with weanling pigs tend to confirm the observations reported by Grimmer and his associates (*E. S. R.*, 77, p. 836) that feeding young pigs 0.1 percent of zinc as zinc lactate in milk for an extended period produces unthriftiness, lameness, and arthritis. The authors consider it probable that the experimental results here recorded do not occur under natural swine-raising conditions in the United States.

The occurrence of Salmonella in the lymph glands of normal hogs, H. L. RUBIN, M. SCHERAGO, and R. H. WEAVER (*Univ. Ky.*). (*Amer. Jour. Hyg.*, 36

(1942), No. 1, pp. 43-47).—The mesenteric lymph glands from apparently normal hogs were examined for the presence of *Salmonella*, using the tetrathionate medium of Kauffmann for enrichment. Of 40 lots of hogs consisting of 25 animals each, 19 yielded *Salmonella*. Of 50 hogs examined individually, 5 yielded *Salmonella*. The types of *Salmonella* which were isolated are as follows: *S. typhimurium*, *S. choleraesuis kuzendorf*, *S. oregon*, *S. anatum*, *S. give*, *S. bareilly*, *S. derby*, *S. new-brunswick*, *S. bredeney*, *S. enteritidis*, *S. lexington*, *S. newington*, and *S. worthington*.

Grass silage—a hazardous horse feed, A. T. and R. GILYARD (*Cornell Vet.*, 32 (1942), No. 3, pp. 317-321).—Attention is called to the danger of feeding grass silage to horses. It is pointed out that any silo and method of preparation can have areas of incomplete curing in which the botulism organism (*Clostridium botulinum*) may develop, and the report indicates that the products of putrefaction in these areas may not be particularly deleterious to bovines yet hold potential disaster for horses. In the case described, the silo under consideration was of wooden construction with a concrete foundation. The silage was oats and field peas, and molasses was added in the proportion of 110 lb. to the ton. Consistent clinical observations, combined with the absence of gastrointestinal symptoms, in nine patients observed within 72 hr. strongly support the diagnosis of botulism. It is also significant that prophylactic use of polyvalent antitoxin apparently protected the remaining two patients that were on a ration including silage. The therapeutic value of antitoxin was insignificant.

Equine virus abortion, W. W. DIMOCK, P. R. EDWARDS, and D. W. BRUNER (*Kentucky Sta. Bul.* 426 (1942), pp. 20, figs. 5).—A practical summary is given of the status of knowledge of virus abortion based in large part upon work conducted at the Kentucky Station since 1932, during which time 19 outbreaks of this affection in mares, including 119 abortions, all of which occurred in the State, were studied. The pathological changes noted in the aborted fetuses were small necrotic areas in the liver, hemorrhages on the thoracic and abdominal viscera, and an accumulation of fluid in the pleural cavity. Intracellular inclusion bodies were present in the liver and lungs. No such inclusions were found in the tissues of fetuses not affected with virus abortion. The disease is known to exist also in Virginia and California, and reports indicate it to be present in other localities of the United States and Canada. Seventeen cases of abortion of mares in Germany were described in 1937, confirming the findings of Dimock and Edwards that the disease was caused by a virus. The infection was also reported in Yugoslavia and in Hungary in 1938.

Included in the account are (1) a description of outbreaks, (2) findings in post-mortem examination of fetuses and foals, (3) transmission experiments with mice, rabbits, guinea pigs, and eggs, in addition to mares, (4) treatments for immunization of mares, and (5) observations on the transmission and control of the disease.

Earlier contributions on the work at the station by Dimock and his associates have been noted (*E. S. R.*, 77, p. 102; 83, p. 309).

Infectious equine encephalomyelitis in the United States in 1941 (*North Amer. Vet.*, 23 (1942), No. 7, pp. 461-463, figs. 3).

Observations on phenothiazine as an anthelmintic in horses and with reference to blood examination, T. GRAHAM, J. E. N. SLOAN, and P. G. D. MORRIS (*Vet. Rec.*, 54 (1942), No. 22, pp. 213-214).—In experiments with phenothiazine to determine its effect upon the horse, the results of which are presented in tables, the fluctuations of the blood cells were so slight as not to be of any great significance. It is concluded that eosinophilia is not necessarily a concomitant of strongyle infection even when aneurysms are present. The data obtained from four horses show that phenothiazine administered at dose rate of

25-30 gm. per horse gives excellent results against all the smaller strongyles and *Strongylus* spp. and moderate results against young stages of *Oxyuris equi*, but has no effect on adult *O. equi* and immature *Parascaris equorum*.

An epizootic of canine distemper in a zoological park, W. H. ARMSTRONG and C. H. ANTHONY (*Cornell Vet.*, 32 (1942), No. 3, pp. 286-288).—In an outbreak of canine distemper in a large zoological park collection of various Canidae the virus proved infectious for several related species, including the common dog and ferret, red fox, eastern gray fox, kit fox, raccoon dog (*Canis procyonoides*), and Australian dingo. Following the appropriate prophylactic and therapeutic use of a commercial dog distemper antiserum on several related canine species, no new cases or deaths occurred.

An improved diagnostic stain for distemper inclusions, W. G. PAGE and R. G. GREEN. (Univ. Minn. et al.). (*Cornell Vet.*, 32 (1942), No. 3, pp. 265-268).—Description is given of a new staining technic for the demonstration of the cytoplasmic inclusions of canine distemper applicable to both paraffin sections and fixed smears for rapid diagnosis. It is superior to hematoxylin eosin in the demonstration of small inclusions and gives greater differentiation between inclusion bodies and cytoplasmic artifacts.

A non-virulent, single-dose vaccine for prophylactic immunization of dogs, L. T. WEBSTER and J. CASALS (*Jour. Expt. Med.*, 76 (1942), No. 2, pp. 185-194).—The authors have found that a single injection of nonvirulent irradiated vaccine, prepared in the manner described, immunizes mice and dogs effectively against a subsequent test inoculation of virulent rabies virus and does so to a greater degree than do other vaccines now obtainable. It is easily and quickly prepared, keeps well, and has a low nitrogen content.

Thiamin deficiency and Chastek paralysis in foxes, A. Z. HOBSON and S. E. SMITH. (Cornell Univ. et al.). (*Cornell Vet.*, 32 (1942), No. 3, pp. 280-285).—In the investigation here reported the clinical symptoms of anorexia, weakness, ataxia, spasms, and lowering of the body temperature were observed in foxes fed a thiamin deficient diet. These symptoms are apparently identical with those of foxes suffering from Chastek paralysis as a result of feeding an adequate diet with added uncooked fish (smelt). Both conditions were cured completely with thiamin chloride. Chastek paralysis was not cured by pyridoxin, riboflavin, or calcium pantothenate. A diet suitable for the determination of the thiamin requirements of foxes is given. The work supplements that reported by Green et al. (*E. S. R.*, 85, p. 672).

[Work in avian pathology by the Massachusetts Station] (Massachusetts Sta. Bul. 388 (1942), pp. 99-103).—The work of the year on diseases of fowls (*E. S. R.*, 85, p. 815) reported upon by H. Van Roekel, K. L. Bullis, O. S. Flint, M. K. Clarke, and C. Olson, Jr., included pullorum disease eradication, flock mortality, isolation of *Salmonella* types, avian encephalomyelitis, infectious bronchitis, and neoplastic and neoplasticlike diseases (*E. S. R.*, 87, p. 721).

Salmonella bredeney infection in birds, W. R. HINSHAW, T. J. TAYLOR, and E. McNEIL. (Univ. Calif.). (*Cornell Vet.*, 32 (1942), No. 3, pp. 337-339).—The authors report upon the presence of *S. bredeney* in chukars (*Alectoris chukar*), turkeys, and ducks in California. An outbreak of paratyphoid in chukars from which both *S. typhimurium* and *S. bredeney* were isolated is described.

Un nuevo tratamiento para el moquillo [A new treatment for avian diphtheria], C. M. MUÑIZ and R. MORENO (*Agr. Expt. [Puerto Rico Univ. Sta.]*, 2 (1942), No. 3, p. 8).—The value of sulfathiazole, administered for 10 days at the rate of 0.25 gm. to each ounce of food, in the treatment of avian diphtheria is pointed out. Such treatment, however, is not a substitute for approved sanitation and the proper food ration, which should include cod-liver oil with vitamin A.

Coccidiosis control in chickens, E. M. DICKINSON (*Oregon Sta. Bul. 405 (1942)*, pp. 23, figs. 7).—This is a practical account of coccidiosis, including (1) the cecal form, commonly encountered during the brooding period and characterized by bloody diarrhea, and (2) the intestinal form, commonly met with in young pullets and characterized by sudden loss of appetite, drop in egg production, and "going light." Resistance against a species of coccidia develops following a suitable infection with coccidia of that species, but resistance developed by one species will not protect against infections by other species of coccidia. Outbreaks of these forms are brought under control by daily cleaning the poultry house for a period of 5 to 7 days. Moist mash or a brief nutritional flush that will stimulate the appetite may help to a more prompt recovery. A system of management and sanitation based on knowledge of the parasite may check or prevent the regular occurrence of outbreaks of clinical coccidiosis.

Sulfonamide therapy of malaria in ducks, E. K. MARSHALL, JR., J. T. LITCHFIELD, JR., and H. J. WHITE (*Jour. Pharmacol. and Expt. Ther.*, 75 (1942), No. 1, pp. 89–109, figs. 7).—The authors have found the maintenance of a more or less constant blood concentration of a sulfonamide drug for a sufficient length of time to be just as important for effective therapy in *Plasmodium lophurae* infections in ducks as it is in bacterial chemotherapy. The degree of parasitemia in treated ducks at the time when untreated birds are at the height of their parasitemia can be used as a criterion of effectiveness of therapy. Under experimental conditions the degree of parasitemia on the sixth day after infection was correlated with survival time and percentage survival. The antimalarial activity of a number of sulfonamides and sulfones has been tested. Para-aminobenzoic acid has slight antimalarial activity and has a definite antagonistic effect on the antimalarial action of sulfonamide drugs. A list of 30 references to the literature cited is included.

Studies on the host-parasite relationships of untreated infections with *Plasmodium lophurae* in ducks, R. HEWITT. (Univ. Tenn. et al.). (*Amer. Jour. Hyg.*, 36 (1942) No. 1, pp. 6–42, pls. 2, figs. 10).—Report is made of observations on the course of untreated infections with *P. lophurae* in approximately 300 ducks of mixed ages, weights, and breeds. Over 75 percent of 30 young ducks infected (from 4 to 7 weeks old) died from what appeared to be the effects of the parasite, and infections in from 10 to 15 percent of approximately 250 adult ducks terminated fatally. The findings are presented under the heading of susceptibility of young and adult ducks to infection with *P. lophurae*, hematology of unparasitized ducks, changes which occur in the blood of ducks infected with *P. lophurae*, and temperature and periodicity studies. A list of 26 references to the literature is included.

Parasite free poultry produces, M. W. EMMEL. (Fla. Expt. Sta.). (*Fla. Grower*, 50 (1942), No. 6, pp. 14, 15, fig. 1).—Treatments that end chicken flock losses due to ectoparasites are described.

AGRICULTURAL ENGINEERING

[**Agricultural engineering investigations by the Arizona Station**] (*Arizona Sta. Rpt. 1941*, pp. 21–29, fig. 1).—These included studies of ground water in the upper Santa Cruz Valley, the Cortaro-Marana district, the Eloy district, and the Little Chino Valley; physiographic correlations (E. S. R., 80, p. 304); wells and pumping machinery; forecasting the water supply; and the tamarisk tree and its wood.

[**Agricultural engineering investigations by the Massachusetts Station**] (*Massachusetts Sta. Bul. 388 (1942)*, pp. 49–50).—These included a cranberry

storage investigation by C. I. Gunness, H. J. Franklin, and C. R. Fellers; an apple storage investigation, by Gunness; and a poultry house investigation, by Gunness and W. C. Sanctuary.

[Agricultural engineering work by the New Haven Station] (*Connecticut [New Haven] Sta. Bul. 452 (1942), p. 14*).—A portable charcoal kiln and a study of the use of native hardwoods for fencing are reported upon by W. O. Filley et al.

Percolation and water requirement studies with alfalfa by means of lysimeters in Oregon, S. H. HASTINGS and H. K. DEAN. (Coop. U. S. D. A.). (*Oregon Sta. Bul. 404 (1942), pp. 16*).—Experiments carried out at Umatilla with eight lysimeters from 1915 to 1931 are reported in detail. One unit was uncropped, one planted to soybeans in the summer and vetch in the winter, and the remaining six to alfalfa. Five soil types ranging from a sandy type to a fine silt loam were used. For the 1922–31 period the mean percolation from the six lysimeters filled with sandy soil and having mean annual water applications of 60.5 in. ranged from a maximum of 72 percent for the uncropped unit to a minimum of 7 percent from that cropped to alfalfa. For the same period the mean seasonal water input applied to lysimeters seven and eight filled with finer-textured and more productive soils was 116.85 in., and the percolations were only 9 and 8 percent, respectively. Losses by evaporation from an uncropped lysimeter were 0.54 percent as much as from an evaporation tank.

For the 10-yr. period 1922–31 the seasonal water requirements of alfalfa, in inches of water per ton of hay produced, ranged from a minimum of 8.8 to a maximum of 11.50. The more productive soils proved to be the more economical in the use of water. Approximately doubling the water input, i. e., using 116.85 compared with 60.5, not only returned the highest yield of alfalfa but resulted in a highly efficient use of the irrigation water on the more productive finer-textured soil types. The computed yields of alfalfa per acre from lysimeters filled with rather sandy soil types were somewhat in excess of those harvested from comparable soils under favorable conditions in the Umatilla area. Such results were obtained with water inputs of approximately 5 ft. When this amount of water was applied to a lysimeter in which a productive silt loam soil was utilized, the indicated yield per acre was 7.72 tons. When the water inputs were nearly doubled or increased to 118.46 in. annually the mean yield of alfalfa was increased to 15.44 tons per acre. These substantially increased yields are attributed to (1) the use of productive soils, (2) heavy water applications, and (3) such frequent water applications that the soil moisture was maintained at more nearly the optimum.

Water-disposal planning techniques, W. A. WEID. (U. S. D. A.). (*Agr. Engin.*, 23 (1942), No. 5, pp. 152–154, figs. 2).—Improvements in such technic since the inception of the soil conservation program in the southeastern United States 8 yr. ago are summarized. Developments mentioned included adaptation of stereoscopic delineation and analysis of natural drainage features on aerial photographs as an initial step in the planning process, the introduction of water-disposal planning carried out with, instead of after, erosion control and land-use planning, use of meadow outlets and disposal areas capable of yielding a hay or grazing return, special treatment of critical areas within cultivated fields, etc. Emphasis is placed especially upon the recently evolved practice of planning water disposal on a unit watershed basis rather than on the basis of the arbitrary unit of a single farm, and the application of stereoscopic analysis, as above noted, to the study of such watersheds. This type of analysis has the advantages of an effective approach to group action

in the district program providing basic information for use in developing over-all conservation plans for an action program on flood control and land utilization projects; pertinent information applicable to preliminary investigations for drainage surveys; a sound basis for subdividing large tracts of land, along with land-use capabilities; a means whereby highway erosion-control plans may be directly correlated with water-disposal and land-use planning; and a definite aid to water-disposal planning on the individual farm basis, since natural drainage features are identified and properly correlated with those on adjacent lands.

Tilt buckets for measuring run-off and erosion, C. N. JOHNSTON. (Univ. Calif.). (*Agr. Engin.*, 23 (1942), No. 5, pp. 161-162, figs. 3).—For 50-ft. squares of experimentally burned and unburned range brushland it was necessary to devise means for measuring rates of water flow too small to be determined with certainty by means of 90° V notch weirs and stage recorders. The author describes a set-up consisting essentially of a tilt bucket of a capacity on each side of 1 or of 5 cu. ft., the radii being 15 and 21 in. and the face length from 20 to 48 in., respectively, together with arrangements necessary for recording the frequency of tilt with respect to time by means of a stage recorder. Oil dash pots were found a necessary addition to the larger tilt buckets, and pots of a diameter 3 in. or greater were required to prevent breaking of the oil column on the upstroke, with loss of a part of the oil. No. 30 S. A. E. oil was used and a piston clearance of $\frac{1}{16}$ in. A divider taking an aliquot of one twenty-fifth of the contents of each side of the tilt buckets was used for the sampling and was shown to give a silt : water ratio consistently close to that of the stream flowing into the bucket.

Terrace grades on Shelby soil as they affect soil and water losses, A. W. ZINGG. (U. S. D. A. and Mo. Expt. Sta.). (*Agr. Engin.*, 23 (1942), No. 5, pp. 159-160, 162, fig. 1).—In a study covering a 9-yr. period, the total runoff and the number of runoff periods increased with terrace channel grade up to grades of 8 in. per 100 ft. Average maximum rates of runoff for 128 runoff periods increased with channel grade. The average maximum was 5 times greater on the 8-in. grade than on the level terrace. The variable-grade terrace was superior to a terrace of uniform grade. It had the capacity to retain a relatively large volume of rainfall and also to discharge runoff at relatively high rates when hydraulic efficiency was most needed. There was no significant difference in the total time of runoff from terraces of various grade for the 9-yr. period. Total soil loss in runoff increased logarithmically with terrace grade. Increasing the channel grade from level to 8 in. per 100 ft. approximately multiplied the soil loss in runoff by 7 for corn, 4 for small grain, and 3 for meadow crops. Channel grades of less than 2 in. per 100 ft. were not practical on the Shelby soil. Level terraces were satisfactory only on Grundy silt loam ridge tops, where the direction and degree of slope were uniform and the depth of surface soil exceeded 12 in. Channel grades up to 6 in. per 100 ft. may be safely used on the Shelby soil.

Maintaining open drainage ditches by grazing, H. MATSON. (U. S. D. A.). (*Agr. Engin.*, 23 (1942), No. 5, p. 169, figs. 4).—In the areas of south Louisiana studied by the author, willows, sawgrass, alligator grass, water hyacinths, and cattails cause most of the choking and filling of drainage ditches and are the vegetative types most difficult to control. While some of these vegetative types are not actually grazed by livestock, they are effectively controlled in shallow water and along well-shaped ditch banks by the trampling which occurs in a closely grazed pasture. Accompanying illustrations show clearly that drainage ditches in south Louisiana which are not pastured or otherwise maintained may

become almost completely choked and filled within 5 yr., while ditches which have been closely grazed are still in good condition after 20 yr. or more of service. The use of moderate slopes, seeding or sodding, and grazing of ditch banks for the control of erosion and undesirable vegetative growth should be effective in most sections of the United States. To make this possible it will be necessary to fence the ditch, including a strip of land on each side of it, wherever a main or lateral ditch passes through or by land which is not already in pasture, and to provide swinging flood gates at each fence crossing. Arrangements for community grazing may be made to reduce the number of flood gates needed.

Efficiency of combine at various stubble heights, E. A. SILVER. (Ohio State Univ.). (*Agr. Engin.*, 23 (1942), No. 5, p. 168).—The author describes field experiments leading to the definite conclusion that if a combine is operated at a stubble height much lower than 10 in., considerable grain losses will result, and that these may be of such magnitude as more than to counterbalance the value of the straw. At a stubble height of 6 in. the rack loss alone amounted, on one variety, to 26.5 percent. When the machine showing the least loss was set for a 10.5-in. stubble the greatest loss was 5.6 percent. In the case of a 15-in. stubble the loss was practically negligible. The variety of grain and the adjustment of the machine had a marked effect on the extent of the grain losses. The data obtained included records of the grain losses at the cylinder, straw rack, shoe, and cutter bar and power requirements for both power take-off and drawbar.

Equipment combinations for harvesting cornstalks, A. P. YERKES (*Agr. Engin.*, 23 (1942), No. 5, p. 166).—The author describes an experiment carried out on a farm in southern Wisconsin where the fodder was considerably smaller than that commonly found in the Corn Belt proper. Most of the stalks ranged from 6 to 8 ft. in height, but care had been exercised in operating the picker to avoid having wheels run directly over the rows so that the fodder had a higher percentage of stalks still standing with half their lengths erect than is often found. The forage harvester was a 42-in. cut. Its cutter bar was equipped with two grain lifter guards, one running on each side of the row. These guards lifted a great many pieces of stalks from the ground, making them pass over the cutter bar, and also saved many of the top halves of stalks which were hanging from upright stubs. The regular cutter head used for cutting grass or corn for silage did a good job of cutting up the fodder but left many short cylindrical pieces which, after being delivered into the feed chamber of the baler, tended to roll to the bottom and made a very uneven bale. When the cutter head was replaced by one which did not cut but tended to shred the fodder, a satisfactory bale was produced, but the amount of fodder which could be cut and baled per hour with this four-man outfit, taking only one row, would probably be too small, even where the yield was heavy, to make it economical.

An experiment in which a tractor mower and pick-up baler were successfully used behind the combine for cutting and baling straw is also described.

Harvesting cornstalks for industrial use, J. B. DAVIDSON, C. K. SHEDD, and E. V. COLLINS. (Iowa Expt. Sta. and U. S. D. A.). (*Agr. Engin.*, 23 (1942), No. 5, pp. 163-164, fig. 1).—The best labor economy of 13 yr. ago was obtained by a combined harvesting outfit consisting of a mower, a hay loader, and a threader baler with automatic feed driven from a power take-off. During the past year the Iowa Station has studied the windrow pick-up baler. Three methods of breaking and loosening the stalks were tried out—(1) low cutting knives attached to the tractor pulling the side-delivery rake putting the stalks into a windrow, (2) harrowing down with smoothing harrow, twice over, and (3) cutting stalks with a conventional tractor stalk cutter drawn ahead of the side-delivery rake. None of these methods proved entirely satisfactory from the viewpoint of raw material quality, however, and the experiments as a whole

indicated that the stalks must be harvested at the time the ears are harvested and kept off the ground as far as practicable. This will require development of a suitable drying or curing procedure. Partial processing on the farm to retain the more edible portions, useless for pulp manufacturing, is much to be desired, and "if cornstalks are ever to be in demand by manufacturers with the present competition of raw materials from other sources, the process of harvesting must be fully mechanized and the raw material supplied not only at an inviting figure but with a satisfactory return to the farmer." The authors consider the field a promising one for engineering investigation, however.

Baling straw with the pickup baler, A. J. SCHWANTES. (Univ. Minn.). (*Agr. Engin.*, 23 (1942), No. 5, pp. 164-165, 167, fig. 1).—This is a brief summary of practices in the use of this machine as found in Minnesota. The computed cost of baling per ton of straw is given as \$1.57, owner's estimate \$1.73, and charge for custom work \$2.62; tons per acre (yield) 0.52, tons per hour (rate of baling) 2.02, average size of crew 3.55, and man-hours per ton 1.77; hauling distance 0.25-10 miles, tons per hour hauled 2.10, average number of men in crew 2.8, man-hours per ton hauled 1.34, and truck-hours per ton hauled 0.54; and data on weight of bales 76.5 lb., density 12.4 lb. per cubic foot, and moisture content, percent (11.75-17.15) 14.0.

Weed control in growing corn, C. K. SHEDD, E. V. COLLINS, and J. B. DAVIDSON (*Iowa Sta. Bul. P44, n. ser.* (1942), pp. 437-467, figs. 23).—General methods of combating weeds are outlined. Improved equipment which enables the careful farmer to improve the control of weeds in cornfields is described, as are methods of seedbed preparation which assist in control of weeds without excessive input of labor or power. The principal purpose of cultivation of corn is to control weeds, but early cultivation to control sand-blowing is also essential under some conditions.

For early cultivation of corn, the spring tooth weeder and the rotary hoe were effective in killing weed seedlings when the soil surface was lightly crusted by moderate rainfall, but they were not very effective when the soil was heavily crusted by intense rainfall nor when the soil surface was loose and dry. The best cultivator equipment for use when corn plants were small consisted of six sweeps per row and rotary hoe shields. When first cultivation could be delayed until corn plants had grown about six leaves, it was found best to leave off the shields and use half sweeps next to the corn row. The best equipment for second cultivation under usual conditions was one pair of disk hillers throwing soil into the corn row and two pairs of sweeps per row. Experimental scrapers on the disk hillers prevented coverage of corn plants. For the last cultivation the best equipment was the same as for second cultivation, except that scrapers on the disks were not needed. An experimental spring tooth weeder rear attachment for a tractor cultivator was effective in filling tractor wheel tracks, leveling the soil between corn rows and improving weed control. Speed of travel of cultivators to do the best job of destroying weeds was generally between 2.5 and 4 miles per hour.

Three cultivating programs are suggested for check-rowed corn with a view of improving weed control and keeping labor and power input at a minimum.

Spray machinery for orchards, gardens, truck crops, T. E. ASHLEY (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 7, pp. 3-5, figs. 14).—Drawings and descriptions of motorized hand sprayers twice previously described are included in an article of essentially the same content as in Circular 106 (E. S. R., 82, p. 263; 87, p. 728).

Cotton ginning for pure-seed preservation, C. A. BENNETT and F. L. GERDES (*U. S. Dept. Agr. Leaflet 217* (1942), pp. 8, figs. 5).—This leaflet points out the means by which the mixing of seed of different varieties of cotton can be pre-

vented during the ginning processes and also the precautions which must be taken at any gin to make it suitable for the preservation of seed purity. Methods considered practical consist in the use of (1) self-cleaning belts, (2) self-cleaning blowpipe systems, (3) gravity chutes in two-story gins, and (4) combinations of (1) and (2). Systems now in use for putting these methods into practice comprise: (1) A horizontal flat seed belt in a smooth trough below the stands, delivering either to an inclined belt or to a seed-blowing pipe through a vacuum wheel seed feeder. (2) A reversible horizontal flat seed belt beneath the stands, operating in one direction to deliver gin-run seed and in the other to deliver pure seed, each discharging into disposal apparatus by various means. (3) Two individual conveyors beneath the stands, gin-run seed being handled in the front system and pure seed in the rear one, or vice versa, each screw system having its own lifts and deliveries. The pure-seed system, of course, is completely accessible for cleaning between runs. (4) In two-story gins gravity chutes with hinged covers in front of or below each gin stand, diverting pure seed by gravity into funnels, sacks, or belts below. A standard screw conveyor is generally used on gin-run seed. (5) Gravity chutes similar to those described above, short enough for single or two-story gins, delivering pure seed from each gin stand into a blowpipe by means of individual rotating vacuum-wheel seed feeders.

It is pointed out that when elevation of cotton seed is necessary, only the blowpipe or inclined-belt systems can be regarded as self-cleaning. Vertical screw and bucket-type elevators cannot be depended upon to be fully self-cleaning even when seed from several bales have been run through the system in an effort to clean it before commencing to save planting seed.

Wheat storage in experimental farm-type bins, C. F. KELLY, B. M. STAHL, S. C. SALMON, and R. H. BLACK. (Coop. N. Dak., Kans., Md., and Ill. Expt. Stas. et al.). (*U. S. Dept. Agr. Cir. 637 (1942), pp. [2]+245, figs. 33*).—This circular brings up to date findings concerning wheat moisture contents safe for storage in various types of storage structures on the farm in the various wheat-growing areas, supplementing similar results recorded in previous circulars (E. S. R., 83, p. 687; 85, p. 546) and in journal articles (E. S. R., 86, pp. 397, 840). Following a brief introduction and outline of the procedure, it takes up deterioration of wheat in storage; wheat storage in North Dakota, Kansas, Maryland, and Illinois; surveys of bins on farms; underground storage of wheat; changes in fat acidity and germination of wheat from selected locations in stored bulks; use of fungicides, insecticides, and absorbents in farm wheat storage; and the moving and conditioning of wheat. An extensive appendix of numerical data occupies more than one-third of the circular.

Performance of cowls for ventilated grain bins, C. F. KELLY, M. G. CROPSKY, and W. R. SWANSON. (U. S. D. A.). (*Agr. Engin., 23 (1942), No. 5, pp. 149-151, figs. 3*).—In tests of four different types of bin ventilators, two pressure and two suction, at Fargo, N. Dak., it was found that the air pressure developed by the pressure cowls closely approached the velocity pressure of the wind. The negative pressures developed by a turbine ventilator and a suction cowl were only about 40 percent as great, however. Of the cowls or duct systems tested, only two, which were not on test during periods of highest winds, excluded all snow, indicating that ventilators should be closed during the winter months. It was observed that in storms with ordinary wind velocities louvers were of benefit in excluding snow from pressure cowls, and that the suction ventilators did not catch as much snow as the open-face pressure cowls. Of the two ventilators which excluded all snow in winds reaching 27 and 23 miles per hour in their respective test periods, both were of T trap construction, the lower end of the vertical crosspiece of the T being closed except for a small

drainage opening. The first communicated directly with the down pipe through the wheat by way of an elbow turning downward from the side arm of the T. This ventilator had an adjustable damper in the vertical arm of the T above the side arm. The second of the trap ventilators, without damper, had a side arm in the form of an elbow turning upward into a return bend from which the air entered the down pipe through the wheat. The down pipes of both of these ventilators delivered the air into the bin through screened ends 18 in. below the top of the wheat layer.

The farm freezing plant, W. H. MARTIN and F. E. PRICE (*Oregon Sta. Bul. 399 (1941), pp. 19, figs. 6*).—This bulletin discusses the following plans for the freezer plant preservation of family food supplies, pointing out their respective advantages and disadvantages and indicating the nature of the equipment required and the initial and operating costs of each: Use of a rental locker plant entirely, with no farm refrigerator; a rental locker plant with a standard household refrigerator; a rental locker plant with a household refrigerator having a 1- to 6-cu. ft. freezer compartment or a separate 6-cu. ft. freezer refrigerator; a large chest type farm freezer and renting of space to chill and age meat before freezing; and a two-compartment farm freezer plant with both 0° and 35° F. storage. With reference to the equipment of which a part is to be built by the owner, the bulletin takes up insulation; vapor barrier; general, wall, ceiling, and door construction; the home-built door; interior wall and door finish; refrigeration surface; power consumption; controls; defrosting; electrical service; and cost. Sections and floor plans for the construction of a plant including a 35° and a 0° room of from 130 to 200 and 44 cu. ft. capacity, respectively, are included, together with detailed drawings for stock door installation and for home-built doors for each of these rooms.

Engineering performances of a multiple-baffle electric sterilizer, J. E. NICHOLAS. (Pa. Expt. Sta.). (*Agr. Engin.*, 23 (1942), No. 5, pp. 155-156, figs. 2).—The temperatures of dairy utensils as recorded by thermocouples attached to them during a sterilizing process are reported. With a sterilizer designed to provide a more uniform heating of the utensils and when they were loaded as shown, the maximum and minimum utensil temperatures were 205.8° and 190.8° F. The maximum and minimum air temperatures were 227.5° and 192.1°. Higher or lower temperatures could be obtained by adjusting the thermostat.

The profit aspect of industrial use of farm residues, F. G. KRANICK (*Agr. Engin.*, 23 (1942), No. 5, pp. 164, 166).—The author discusses very briefly some of the differences of viewpoint between farmer and manufacturer which create problems in the industrial utilization of straw and cornstalks, mentioning as an illustration of some phases of the general problem a field where grain was harvested by a combine and the stubble cut with a 12-ft. windrower. This field of 47 acres was baled in 47 hr. and produced 1,121 bales of 60 lb. each, that is, 23.8 bales per acre, or 1,431 lb. of straw. This yield of 0.72 ton of straw per acre is low, and the result is not encouraging with respect to income, considering the amount of work and interest on equipment. The manufacturer's needs call for a fixed yield with short hauls to the factory and for a constant supply year after year, whereas farm yields vary with many factors, some of them not controllable or predictable. The farmer desires heavy grain yields and short straw, whereas the strawboard mill prefers abundant long straw at a moderate price. A further complication is presented by the fact that "the strawboard mills are in Illinois, Indiana, Ohio, etc., where the straw is useful to the farmer. In the West, in such States as Nebraska, Kansas, South Dakota, and North Dakota, they have straw to burn but no mills to use it."

Practical electrical wiring, H. P. RICHTER (*New York and London: McGraw-Hill Book Co., 1941, 2. ed., pp. X+521, figs. 457*).—In the preparation of the second edition some new material has been added, and the entire contents of the first edition have been retained. The present volume has been made to conform in all respects with the 1940 National Electrical Code. The book covers the wiring of structures of limited size and for ordinary voltages.

Spray painting of farm buildings, L. A. BUSE (*Agr. Engin., 23 (1942), No. 5, pp. 157-158*).—After some unsatisfactory initial experience, an insurance company having a large number of Midwest farms to prepare for resale found spray painting to be much more rapid and, in quality, equal to or better than brush painting. A four-man crew of two spray-gun operators and two helpers could put two coats of paint on an average set of farm buildings in 2.5 days, whereas the same work (10,000 sq. ft.) would require 10 days or more if done by a brush crew of four men. Cracked, checked, porous, and dust-covered siding boards were better protected by sprayed paint because paint so applied was driven into crevices, etc., instead of merely bridging them, as did paint applied with a brush.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics by the Arizona Station, 1941] (*Arizona Sta. Rpt. 1941, pp. 16-18, 20*).—In addition to results previously noted, brief findings are included as to the relationship of soils in the Casa Grande Valley to cotton yields; the ability of farmers in the Wellton-Mohawk area of Yuma County to pay irrigation water costs; the average net farm income, cost of living, etc., in 1940 of 52 families with loans from the Farm Security Administration; and forms of Arizona farm leases.

[Investigations in agricultural economics by the Kentucky Station, 1941] (*Kentucky Sta. Rpt. 1941, pp. 35-41*).—In addition to findings previously noted, statements are included giving facts ascertained as regards farm management in a study of some 6,000 farms in the southwestern Pennyroyal region; adjustments for loss of income from dark tobacco in western Kentucky; the costs in 1940 of operating 43 tractors in Union and Henderson Counties as compared with the costs in 1930 of operating 36 tractors in Christian and Todd Counties; returns from beef-cow herds; changes in market outlets for Kentucky livestock; auction markets as outlets for Kentucky livestock; organization of tobacco auction markets; and trends in the demand and consumption of United States tobaccos.

[Investigations in agricultural economics and farm management by the Massachusetts Station, 1941] (*Massachusetts Sta. Bul. 388 (1942), pp. 4-7*).—In addition to results of studies previously noted, brief statements are included of findings in studies (1) of the Boston Regional Produce Market by A. A. Brown and M. Booth; (2) of vegetable growing in Bristol County and diversification of the farm business in Essex County, both by C. R. Creek; (3) of rural operations and credit in the State by A. H. Lindsey and S. Russell; and (4) of land tenure in the State by Lindsey and E. Collins.

Current Farm Economics, [August 1942] (*Oklahoma Sta., Cur. Farm Econ., 15 (1942), No. 4, pp. 109-140*).—In addition to the usual review of the agricultural situation and tables on prices, price indexes, and indexes of purchasing power of Oklahoma products, etc., articles are included on (1) Cotton in War Time, by K. C. Davis and W. A. Williams (pp. 115-130), which discusses the effect of war on cotton production in Oklahoma, the changes in the demand for cotton, the possibility of Oklahoma farmers adjusting production to meet the wartime demand, the effect of war on the price of cotton to farmers, the

grades and staple lengths that will be most in demand, how Oklahoma farmers may adjust production to receive a higher price for their cotton, and loan price v. market price; and on (2) Farm Labor as a Factor Affecting Agricultural Production in 1942 and 1943, by R. T. McMillan (pp. 131-137), in which the factors affecting the supply of agricultural labor, the prospective changes in demand, and the agricultural employment outlook for October 1942 and for 1943 are discussed. The author found no general shortage in agricultural labor was to be expected in Oklahoma for the remainder of 1942 and during 1943. "The prospect of a quality shortage in agricultural labor is imminent, with experienced first-class dairy workers, ranch laborers, tractor drivers, and combine operators being scarce during the next 18 mo. at least." One of the chief problems is the transportation of laborers. Wage rates of agricultural labor may be expected to advance still further. "More intensive use of available labor and machinery resources should minimize the chances of any acute labor shortage. . . . An over-all increase of 10 to 15 percent in the agricultural production for 1943 could be planned without any serious labor handicaps."

[Investigations in agricultural economics by the Wyoming Station, 1940-41] (*Wyoming Sta. Rpt. 1941*, pp. 7-9).—Brief statements are made as to the effects of (1) percentage of capital invested in livestock, productive work units per man, percentage of calf crop, number of cattle units, and production of beef per cattle unit upon returns on investment on livestock ranches in Sheridan and Johnson Counties; and (2) of work units per man, cows per man, and efficiency of feeding on returns on dairy farms in the Star Valley in Lincoln County.

Comparisons of criteria for the rating of agricultural land, J. O. VEATCH and I. F. SCHNEIDER. (Mich. Expt. Sta.). (*Mich. Acad. Sci., Arts, and Letters, Papers*, 27 (1941), pp. 441-447).—A comparison is made of ratings of land in Michigan by counties on the basis of money value per acre as given in the United States census with ratings on the basis of physical character of soil and land types and the generally accepted, though qualitative, productivity ratings of the types. The two ratings do not agree very closely. Possible criteria for the economic classification of agricultural land are listed. The conclusion is that a classification based upon a number of factors is likely to be of more value than one based upon a single criterion, but that no classification can be strictly mathematical because the necessary basic data are unobtainable.

Management of public land in North Dakota, M. H. TAYLOR and R. J. PENN. (Coop. U. S. D. A.). (*North Dakota Sta. Bul. 312* (1942), pp. 32, figs. 4).—The amounts and kinds of publicly owned lands held by different agencies, the acquisition of lands by and the sales and leasing programs of the agencies, the effects of public land management on farm and ranch operations, type of purchasers and lessees from different agencies, size of operations of purchasers and lessees, the changes in use of land accompanying changes in ownership, the effects of sales and leases on security of tenure, etc., are discussed. Suggestions are made for the improvement of the management of public land.

Budgeting in Texas Counties in terms of living within available resources, H. C. BRADSHAW. (Tex. Expt. Sta.). (*Southwest. Social Sci. Quart.*, 21 (1941), No. 4, pp. 325-334).—This discussion is confined to a single measure of the effectiveness of county budgeting, namely, the degree to which the counties are able to live within their available resources. "The fact that 83 percent of the current or operating funds lived within their available resources in 1935 is some indication that county officials are applying budgeting principles to government. The further fact that in 26 counties selected from the 60, the good results obtained in 1935 were continued and improved upon during the 4-yr. period 1936-1939 indicates that the gains of the single year 1935 were not lost as time went on."

Farm rental arrangements in Georgia, J. C. ELROD, D. E. YOUNG, and W. T. FULLILOVE. (Coop. U. S. D. A.). (*Georgia Sta. Bul.* 220 (1942), pp. 50, fig. 1).—Seeking ways to increase food production during the war, prevailing renting practices among farmers of the State were studied. In 1930, 75 percent of all tenant farms produced cotton, whereas only 50 percent of owner-operated farms grew cotton. In contrast, only 29 percent of all dairy farms and 24 percent of all livestock farms were operated by tenants. Cash renting increased from 17 percent of all renters in 1920 to 41 percent in 1940. The cash tenant assumes full management, takes all risks, and pays a fixed cash rental. Under standing renting agreements the landlord furnishes the land, buildings, fences, repairs, fuel wood, and taxes, while a tenant does everything else and retains all the farm income, except a fixed quantity of cash crops which serve as rent. The tenant manages the farm and runs all risks of operating capital and changes in crop yields. Share renting and sharecropping arrangements are also discussed, and suggested rental agreements are included.

Labor, power, and machinery on small farms in Ohio, F. L. MORISON and R. V. BAUMANN. (Coop. U. S. D. A.). (*Ohio Sta. Bul.* 628 (1942), pp. [1]+38, fig. 1).—Labor, horses, tractors, and equipment are surveyed. Also included are discussions of total investment in power and machinery; total cost of labor, power, and machinery; a comparison of matched farms; and further considerations in adjusting power to farm needs. The conclusions reached are that farmers can operate small farms with one-plow or second-hand tractors as cheaply as with horses. Those who have tractors find many opportunities for additional income. Field work can be done more quickly, and more off-farm work can be done for extra cash income. Crops can be cared for at optimum time, and more livestock can be kept. On most small farms the long-time average costs of operating with a tractor are no greater than those of operating with horses. Tractor farms, however, call for a larger investment and cash outlays for fuel, whereas farmers using horses can produce their own horse feed.

Forecast of seasonal labor requirements for California crops, 1942 (as of April 20, 1942), R. L. ADAMS (*California Sta., 1942*, pp. [1]+14).—Tables are included showing as of May 1, 1942, the assumed acreages and yields of the most commercially important California field, fruit, and truck crops and by months the man-days of labor and number of workers required for each crop. "The need for seasonal labor in California during 1942 is forecasted as a grand total of 26,110,494 man-days."

Sugar beet costs and management in irrigated sections of western Nebraska, G. H. LAMBRECHT and W. L. RUDEN (*Nebraska Sta. Bul.* 341 (1942), pp. 20, figs. 4).—Two hundred and eighty-six records were obtained from 268 growers for the 1941 crop year as to number of hours of man and horse work, equipment required for each operation, quantity and value of materials used, type and size of equipment, etc. Eighty-four farmers gave detailed information as to the cost of operating equipment. No estimates were obtained for hand work done by contract. An analysis is made of the costs of production and harvesting of sugar beets. The effects of quality of land and of management on costs, the compensation for management and risk, and the possibilities of reducing costs are discussed.

The average cost of production was \$71.89 per acre, or \$5.45 per ton. Hand labor comprised 27 percent of the total cost; other man labor, 21; use of horses, tractors, trucks, and equipment, 16; fertilizers, perquisits provided for laborers, and other miscellaneous expenses, 11; and use of land, 25 percent. The average cost of production and harvesting was \$4.26 per ton on the best

lands with good crop management and \$9.81 with an unfavorable combination of poor soil and management. The average cost per ton was \$4.44 with yields of 23 tons per acre and \$9 with yields of 10 tons.

Cost of production and grove organization studies of Florida citrus, Z. SAVAGE and C. V. NOBLE (*Florida Sta. Rpt. 1941, pp. 35, 36*).—A table shows for midseason orange groves, 18 to 20 yr. of age, for the period 1932-37 and by years, 1937-38 to 1939-40, the costs by items; total costs, returns, and profits or loss per acre; costs, returns, and profits or loss per box; and pounds of fertilizer and soil amendments per acre and per tree.

Poultry costs and profits, R. H. WILCOX and L. E. CARD (*Illinois Sta. Bul. 486 (1942), pp. 32, figs. 12*).—The authors discuss factors affecting the success of general farm and semicommercial poultry flocks, 1932-37.

The cost of production of eggs and pullets in southern Arizona, H. EMBLETON (*Arizona Sta. Bul. 183 (1942), pp. [2]+45, figs. 10*).—Records for 51 farms immediately surrounding Tucson, Ariz., were obtained for the year 1932. Forty-four of the records were used in the analysis of the cost of producing eggs and 37 for the cost of producing pullets. The expenditures, receipts, and cost of producing eggs are discussed. An analysis is made of the effects of annual egg production per hen, size of flock, price of eggs, labor efficiency, mortality, and other factors on the cost of egg production and of number of pullets, source of chicks, quality of pullets, and other factors on the cost of producing pullets. The costs of producing eggs are compared with the findings in the studies in other States.

The average cost per dozen of producing eggs was 25.4 ct., and the average price received was 23.6 ct. The average cash cost of producing eggs was 17.7 ct. The average total cost per dozen decreased from 52.4 ct. on farms with an average annual production per hen of 100 eggs or less to 19.3 ct. with 161 eggs or more; from 34.2 ct. with flocks of 199 or fewer hens to 20.7 ct. with flocks of 1,200 or more hens; from 33.4 to 21 ct. as the number of birds handled per man increased from 899 or less to 2,000 or more; and from 25.7 to 30.3 ct. as mortality increased from 9 percent or less to 40 percent or more.

The net income per farm increased from -\$219 where eggs were sold at 22 ct. or less per dozen to \$63 where sold at 26 ct. or more. The average total cost of producing pullets after deducting receipts from the sale of cockerels and cull pullets was 98.3 ct. per pullet, and the cash cost was 61.5 ct. The total cost decreased from \$1.20 on the farms raising less than 200 pullets to 95 ct. on those raising 600 pullets or more. The cost with chicks from the home flock was 88 ct., with chicks purchased locally \$1.02, and with chicks purchased outside the State \$1.03.

Reserves against short-season losses, W. E. PAULSON. (Tex. Expt. Sta.). (*U. S. Dept. Agr. Farm Credit Admin., News Farmer Coops., 8 (1941), No. 1, pp. 5-6, 31; abn. in Texas Sta. Cir. 96 (1942), p. 21*).—A plan is suggested by which the losses in gin operations of cooperative cotton gins in the high and low plains area in Texas in short crop years can be apportioned against the profits in good crop years.

Rough rice marketing in Louisiana, C. A. BOONSTRA (*Louisiana Sta. Bul. 340 (1942), pp. 39, figs. 10*).—The production of rice in Louisiana; the price trends for rough rice, long run, by varieties and grades, and seasons; the public and farm facilities for storage; the problems in rice milling; cooperative marketing; and the principal requirements of a suitable marketing structure from the farmer's point of view are discussed.

"There is no central market or generally accepted trade quotation on the price of rough rice, since each sale is an individual bargain between the pro-

ducer and processor. . . . Since 1931 the average monthly spread between the price of milled Fancy Blue Rose at New Orleans and the average farm price of rough rice in Louisiana has varied from 1 ct. in 1932 to 3.1 ct. under the processing tax of 1935 and to 2.1 ct. in recent years. There is a strong tendency for the monthly spread to fluctuate around 1.5 ct. a pound when the milled rice wholesale price is 3 ct. a pound, narrowing whenever milled rice is lower than 3 ct. and increasing when milled rice rises above this level." The price per pound of rough rice received by farmers averaged about 50 percent of the wholesale price of fancy milled rice. "Blue Rose and Early Prolific prices are the basis of the price structure and define the general price trend, with Early Prolific generally about 20 to 30 ct. under Blue Rose in the wholesale market." In selected periods of stable market situations since 1930, premiums and discounts for varying qualities of rough rice usually ranged up to 10 percent from the average price paid. "During the past 20 yr. a farmer who stored rice each year would have sold at a higher average price than a farmer selling each year in October. General conclusions from these data are that October and December are the weakest price periods during the active marketing year and that November is usually a favorable month in which to sell. As a general rule, prices are as favorable in November as can be expected at any time during the year." About 50 percent of the rice crop in Louisiana, Texas, and Arkansas is sold by farmers during the months of harvest, August through November. Most of the balance is stored in public warehouses. "The most common charge made by bonded warehouses in Louisiana during 1940-41 was 7 ct. per bag the first month, 5 ct. the second, and 3 ct. the third month or fraction thereof, with 15 ct. a bag being the maximum charge for the season." It is estimated that less than 5 percent of the rice farmers owned facilities for storage. Costs of maintenance of farm storage are very low, and a saving of 10 ct. per bag in the cost of storage of 3,000 bags would soon pay for the materials and give a substantial return for labor in constructing farm storage facilities. "The most permanent, and perhaps most effective, market improvements so far achieved in the rice industry have resulted from cooperative marketing associations among rice farmers. . . . The principal requirements of a suitable marketing structure, from a farmer's point of view, are these: (1) That necessary services be performed as efficiently and cheaply as possible, (2) that the farmers know their product and market situation sufficiently well and have financial support sufficiently strong to place them in an adequate bargaining position, and (3) that competition be enforced among the business enterprises through which the product moves to the consumer. Present rough rice marketing practice indicates that these requirements would be better satisfied, respectively, if (1) bulk handling and centralized selling were used to reduce necessary costs for storage, transportation, handling, and assembling, (2) market news service, rough rice grade knowledge, and independent credit standing were utilized by all farmers to increase their bargaining strength, and (3) competition among millers and buyers were enforced by farm organizations constantly on guard against monopolistic practices wherever they might occur."

Organización del sistema de mercadeo y costos de distribución de legumbres y hortalizas en las ciudades de San Juan y Río Piedras [Organization of the system of marketing and cost of distribution of vegetables in the cities of San Juan and Río Piedras], S. DÍAZ PACHECO and J. R. NOGUERA (*Agr. Expt. [Puerto Rico Univ. Sta.]*, 2 (1942), No. 2, pp. 6-7).—The authors call attention to the volume of business and of needed action to make the distribution of farm produce efficient and to keep within the necessities created by the war.

Importancia del uso de camiones en la transportación de legumbres y hortalizas [Importance of the use of trucks in the transportation of vegetables], S. DÍAZ PACHECO and J. R. NOGUERA (*Agr. Expt. [Puerto Rico Univ. Sta.]*, 2 (1942), No. 2, p. 5).—The authors call attention to the notable reduction in transportation facilities which has affected the supply of country produce in the more important markets of the island. A survey of 53 owners showed that the total cost per mile run in the transportation of farm produce (vegetables and starchy foodstuffs) amounted to 14.45 ct. The cost of hauling a ton a mile was about 6.92 ct. The cost per ton-mile was reduced considerably by an increase in the size of the load and with the increase of the total miles run. The authors point out certain problems which are necessary to be solved to assure regular flow of produce to market, lower costs of hauling, and the removal of other deficiencies.

Livestock marketing in North Dakota, W. L. ETTESVOLD. (Coop. U. S. D. A.). (*North Dakota Sta. Bul.* 31½ (1942), pp. 37, figs. 17).—This study is a part of a regional study made by 14 States in the Corn Belt and adjacent area. It is based on 497 questionnaires returned by farmers throughout the State and 343 interviews with farmers in 26 areas selected at random in the different type-of-farming areas and on schedules obtained from 12 auctions, 25 local cooperative shipping associations, 43 local livestock dealers, 7 local markets or concentration yards, 3 packing plants, and 31 retail meat dealers who slaughter. The types of market agencies, markets used by farmers in selling and purchasing livestock, size of lots bought and sold by farmers, operations of markets and market agencies, the transportation of livestock, the areas served by market agencies, etc., are discussed.

Thirty-nine percent of the cattle, 37 percent of the hogs, and 57 percent of the sheep sold by farmers were sold at terminal public markets. Twenty-five percent of the cattle were sold to local dealers and local markets, and 14 percent to packing plants. Nineteen percent of the hogs and 11 percent of the sheep, respectively, were sold to local dealers and local markets, and 21 and 15 percent, respectively, to packing plants. The number of livestock purchased by farmers in relation to the number sold was comparatively small. The average size of sales by farmers was cattle about 5 head, calves 2, hogs 9, and sheep 34 head. "Thirty percent of the cattle were moved from farms in farmers' own trucks, 41 percent by trucks hired by the farmer, and 29 percent by the buyer. The farmer hauled somewhat more of the calves, hogs, and sheep in his own trucks, while less was hauled from farms by the buyer." "There is much variation in the areas from which the various agencies draw livestock. The retail meat dealers have the smallest territory, followed by the local cooperative associations and local dealers. The territory of the auctions and local markets extends past the local community, while packing plants received from one-half to two-thirds of their livestock from areas more than 50 miles from the plant."

Studies in Vermont dairy farming.—XII, **Dairy farm management in the Champlain Valley and its relation to the price level**, S. W. WILLIAMS (*Vermont Sta. Bul.* 479 (1941), pp. 276, figs. 48).—Continuing the series (*E. S. R.*, 80, p. 551) this bulletin is a thoroughgoing analysis of dairy farming in Vermont for the years 1926-27 and 1932-33. Included are discussions of dairy-herd costs and returns and factors affecting incomes, such as type of milk market, size of business, production per cow, crop yields, labor and capital efficiency, size of miscellaneous farm expenses, choice and combination of enterprises, minor factors, combination of important factors, adjustments in periods of unfavorable prices, and standards for Champlain Valley farms.

Elasticity of supply of milk from Vermont plants.—III, **Forecasting the milk supply**, S. M. JOHNSON (*Vermont Sta. Bul.* 480 (1942), pp. 116, figs. 18).—

In continuation of the series previously noted (E. S. R., 79, p. 124), part 1 of this bulletin is a study of factors related to or affecting receipts of milk and cream at all licensed plants in Vermont. Part 2 is a similar analysis of factors related to receipts per patron at the plant of the Milton Cooperative Dairy Corporation. The bulletin examines and evaluates a number of methods of estimating probable receipts 3 mo. to a year in advance.

"Two different types of data, or a combination of them, may be used as bases for prediction. These are (1) data on how changes in production are brought about, and (2) data on why they are brought about.

"Of the first type, most valuable for purposes of prediction are data on changes in cattle numbers. The number of milk cows can be predicted with considerable accuracy a year in advance, from data on the number of 1- to 2-year-old helpers on hand, and on recent slaughter and interstate shipments of cows. The rate at which grain is being fed is highly correlated with current, but not with future, production, and is of little or no value as a basis for prediction of receipts.

"Of the second type of data, of things which influence farmers to change the numbers of cows milked or feeding practices, and so to change the amount of milk produced and delivered to plants, the relation between milk prices and grain prices, the milk-feed price ratio, has proven to be most closely related to subsequent production, and most useful for purposes of prediction of supply.

"Of the various forms and combinations of factors examined in this attempt to develop a technique for accurate forecasting of the total market supply of milk in a producing area, the group which gave the best results . . . included factors of both types."

Efficiency of milk marketing in Connecticut, I-III ([*Connecticut*] *Storrs Sta. Buls.* 237 (1942), pp. 53, figs. 10; 238 (1942), pp. 29, figs. 2; 239 (1942), pp. 53, figs. 14).—Three papers are presented.

I. Supply and price interrelationships for fluid milk markets, D. O. Hammerberg, L. W. Parker, and R. G. Bressler, Jr.—It was found possible to allocate producing areas to milk markets in a manner that would minimize the cost of moving milk from farms to markets. More efficient transportation and assembly of milk in the revised Connecticut milksheds would result in an average reduction in costs of about 2 ct. per hundredweight for the wholesale milk production of the State. An additional savings of about 1 ct. could be had by other economies—more country separating plants and the better utilization of skim milk. Transportation savings from the revision of milksheds and the delineation of milk separating plant areas would average about 3 ct. per hundredweight. This is equivalent to increased returns of \$100,000 per year to the wholesale milk producers of the 14 markets considered. With efficient truck organization the economies that would result from the allocation of producing areas would be even greater.

II. The transportation of milk, D. O. Hammerberg and W. G. Sullivan.—Recognizing the importance of milk transportation, the station inaugurated studies to describe the operation of the transportation system, the rates charged for transportation, and the savings resulting from possible reorganization of existing systems. Maps were prepared indicating the organization of each route serving the major Connecticut markets, the location of the producers served, and the location of the dealers' plants. It was found that the organization of milk transportation involved many inefficiencies, the charges made for transportation services do not reflect the costs of performing the services, and monopoly situations frequently stem from the sale of milk and these have often been exploited through transportation charges significantly higher than those occurring where monopolistic forces are not important. The milk trucking system of the State has been characterized by a preponderance of

small trucks, excess truck capacity, and extensive overlapping and duplication of routes. The rates charged for transportation failed to follow any consistent relationships with the cost elements involved, such as length of haul, size of truck and of load, and type of roads traveled. Milk trucking operations in Connecticut are carried on under noncompetitive conditions. Dealers' control of transportation by virtue of their positions as purchasers of the milk apparently leads not only to excessive costs and inefficiencies but to monopolistic profits. In 1936 dealer-haulers charged an average of 9 ct. per hundredweight more than independent haulers on routes similar in distance and volume. Recommendations are made for the improvement of the transportation system.

III. *Economics of the assembly of milk*, R. G. Bressler, Jr., and D. O. Hammerberg.—The effects of such factors as length of route and size of truck and of load on costs of operating milk collection routes were determined. The conclusion was reached that the existing system of milk collection is not only inefficient but is exacting excessive profits from milk producers. With efficient organization the payments for the assembly of milk could be reduced about one-third. This would mean an increase in the annual incomes of the wholesale milk producers in the State of approximately \$250,000. To a farmer having 25 milking cows the savings would average about \$125 annually, or an increase of about 9 percent in the net farm income or 14 percent in the labor income that he would have earned in recent years.

Frozen food locker plants in South Dakota, W. P. COTTON and F. U. FENN (*South Dakota Sta. Bul. 360 (1942), pp. 28, figs. 12*).—"The objectives of this study were to determine the extent of the development of locker plants in South Dakota, to ascertain the present practices in the operation and utilization of these plants, and to determine the influence of the use of locker plants on the general level of living of the patrons." The basic data were obtained (1) from questionnaires sent to the managers of the plants, covering the development, use, services rendered, charges, products stored, type of patronage, etc.; (2) from questionnaires obtained from 124 patrons of 21 plants, covering the use of locker plants, benefits derived, and comments relative to the operation of the plants; (3) 30-day records of the butchers of 13 plants as to species, class, weight, grade, market price, and live value relative to carcass value of each animal killed; and (4) a detailed survey of a limited number of representative plants. The ownership, business association, and patronage of the plants are described. An analysis is made of the extent of storage and source of various products, locker rental rates and services rendered, and profitability of the plants. The facilities, operating practices, plant investment, and financial operation of a limited number of plants studied in detail are analyzed. The kind and quality of meat stored and savings and benefit accruing to locker patrons are discussed.

Status and trend of agricultural cooperation in Maryland, P. R. POTTENBERGER, J. R. IVES, and S. H. DEVAULT (*Maryland Sta. Bul. 441 (1941), pp. 267-324, figs. 14*).—"The objectives of this study were "to show the extent and character of farmer cooperatives, that is, the number, type, and location of associations, kind of commodities handled, total volume of business done, number of members and patrons, operation practices, etc.; to develop briefly the history of cooperation and to study the influences shaping cooperative development; to emphasize the points of weakness and strength in the operation of Maryland associations, indicating the causes of past failures and the reasons for successful operation; and to obtain information for those persons interested in cooperation and particularly for agricultural leaders who are fostering the cooperative movement in the State." Data were obtained from a questionnaire and interviews with managers of cooperatives and from agricultural leaders, county agents'

annual reports, and the U. S. D. A. Farm Credit Administration. Not only were contacts made with active associations, but as much information as possible was obtained regarding inactive or preexisting associations. The development and present status of the cooperative associations of the State—number, type, membership, patrons, volume of business, and financial growth—are discussed. The cooperative marketing of different farm products is described, with charts showing the total cash farm income from the different products and the value of the products marketed cooperatively by years, 1930-39. The total value of farm supplies used, the local and regional purchasing cooperatives, the value of supplies purchased cooperatively, the farm service organizations, and the federally sponsored cooperatives are described. The cooperative aspects and business operations of the associations (except out-of-State cooperatives) qualifying under the Capper-Volstead Act are analyzed in sections on business and cooperative organizations, methods of financing, measures of financial conditions, and operating practices. Suggestions and recommendations are made for furthering the cooperative movement in the State.

The percentages of the total cooperative business accounted for by marketing, purchasing, and service cooperatives were 84.4, 14.8, and 0.4, respectively. In 1939 farm products valued at approximately \$13,504,500, 19.9 percent of the total farm income, were marketed cooperatively, and the purchasing cooperatives did \$3,884,700 worth of business. The proportion of the total cash farm income accounted for by cooperative sales of various commodities for 1939 was as follows: Milk and milk products, 54.7 percent; poultry and eggs, 2; grain, seed, and hay, 5.1; tobacco, 26.9; truck crops and canning crops, 12.9; fruit, 3.8; and wool, 17.3 percent. Feed accounted for about 51.4 percent of the total purchases; fertilizer, 25.7; seed, 10.1; and miscellaneous supplies, the remaining 12.8 percent. The total liabilities of all associations in 1939 were slightly more than two-thirds of the net worth. Accounts payable were nearly 40 percent of the total liabilities. More than 50 percent of the loans were short term, and most of them were commodity loans. "Almost one-third of the associations analyzed had a current ratio of less than the 2:1 ratio which is considered desirable. About 60 percent of the associations had better than a ratio of 60 ct. total net worth for every \$1 of total assets, which is considered a desirable member's equity. The reserve ratio used was the ratio of total surplus and reserves to business done. Slightly more than one-half of the associations have accumulated reserves of less than 10 percent of their business. In 1939, the operating expense was less than 10 percent of total sales for 23 of the 36 associations and less than 5 percent for 18 of the . . . associations."

Fruit and vegetable cooperatives in Michigan, G. N. Morris (*Michigan Sta. Spec. Bul. 317 (1942), pp. 98, figs. 8*).—This bulletin is one of a series (E. S. R., 79, p. 555) designed to bring the previous study (E. S. R., 60, p. 187) of cooperative associations in Michigan up to date. It includes the decade 1929-38. It is based chiefly on an analysis of data for 20 cooperatives engaged primarily in marketing fruits, 6 marketing vegetable or truck crops, and 6 concerned with vegetable or fruit processing. Potato marketing associations are not included. The major part of the data was obtained from personal interviews with managers of the cooperative associations and examination of the financial and other records of the associations. The history of cooperative fruit and vegetable marketing cooperatives in the State is described. An analysis is made of the operating methods, cooperative standards and corporate structure, capital structure and financial ratios, earnings, management problems, the comparative efficiency of the cooperatives, etc. Appendixes include a sample contract for a cooperative association, a sample contract for a cooperative cannery, score cards for cooperative management, and a summary of the cooperative standards.

"The 10 principal conclusions from the study may be stated very briefly as follows. There must be (1) a genuine need for the cooperative, (2) an adequate volume of business, preferably in excess of \$100,000 per year, (3) efficient operation, (4) an effective membership relations program, (5) a minimum of overlapping in the territories served by different associations marketing the same commodities, (6) some expansion of facilities to serve a larger membership. There has been (7) a gradual trend toward more general use of contracts between members and the association, and (8) a more general use of management ratios as a guide to the management is desirable, but should not be overrated. (9) A plan of some kind to permit a more frequent and thorough exchange of plans and ideas among the managements of the cooperatives seems to promise worth-while results. Finally, (10) if a federated or centralized type of central marketing exchange is again attempted in Michigan, the locals will be uninterested unless convinced in advance that the shortcomings which developed in the past are unlikely to occur in the contemplated one."

A survey of the cooperative marketing of eggs in Michigan, A. HOWLAND. (Coop. U. S. D. A.). (*Michigan Sta. Quart. Bul.*, 24 (1942), No. 4, pp. 326-337).—This article is based largely on a survey made in June 1939 to ascertain the cooperative associations then handling eggs or poultry, the associations which had discontinued the handling of eggs or poultry, and those that were interested in a program to handle such products. An analysis is made of the data from 24 of the 38 associations that handled poultry and eggs. The types of associations handling these products, the reasons for the products being handled, the production conditions affecting marketing programs, the financial risks in egg marketing, and the accomplishments achieved by cooperative marketing of eggs and poultry are briefly discussed. The egg procurement practices and the egg-grading programs of the associations are discussed, with tables showing data as to frequency of deliveries of eggs; egg-hauling practices; the basis of purchase, frequency of payments, and the waiting period for payment for eggs; and the egg quality production and preservation factors emphasized.

In June 1939 only 38 cooperative associations were handling eggs and poultry, 32 had discontinued the handling of such products, and 54 were interested in undertaking an egg and poultry marketing program. Only 1 association was organized primarily to handle eggs and poultry. Associations handling farm supplies and creameries handled the larger volumes of eggs and poultry. About 100 cases of eggs per week are the minimum volume required for a successful Federal-State egg-grading station. No association used any form of compulsion or marketing agreement to influence frequent deliveries of eggs, but the managers of 7 associations placed emphasis on frequent deliveries. Usually the associations did not collect eggs from the farms. Protection of eggs collected by truck against heat and cold was practiced by only 2 of the 7 associations that collected eggs. "All except 1 of the associations purchase eggs on the basis of a definite paying price upon the date of receipt. This single exception operates upon a weekly pool basis." Only 5 associations paid price differentials based on shell color of eggs. Only 2 associations recognized shell texture in their grading operations. Cleanliness was a factor considered by 7 associations, and 7 associations also used a price differential based on internal quality of the eggs.

Cooperative wool marketing in Kentucky, C. D. PHILLIPS and C. M. AULL. (Coop. U. S. D. A.). (*Kentucky Sta. Bul.* 424 (1942), pp. 24, figs. 3).—The organization and operation of the six local wool pools of the State and of the Kentucky Wool Growers' Association are described.

Some 2,500 farmers, 8.3 percent of all Kentucky wool growers, sold wool through the six local cooperative pools in 1940. The seven cooperative associations handled about 632,000 lb. of wool, 11 percent of the wool clip, in 1940.

Some of the local associations secured as much as 6 ct. per pound above the State average, while others sold wool at less than the State average. The cost of handling wool in 1940 by the local associations ranged from 0.3 to 2.3 percent of the value of the wool handled. The cost of handling by the State association was 8.8 percent.

Farm parity prices and the war, M. GUIN (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 7, p. 1).—A brief discussion.

Wheat and flax prices received by farmers in north central and north eastern South Dakota, 1890–1940, W. H. PETERSON (*South Dakota Sta. Cir.* 37 (1942), pp. 16, figs. 7).—"This circular is the first of a series intended to present in a simple and objective manner the prices farmers have received for their more important products over a 50-yr. period, the crop years of 1890 through 1939. An interpretation of the significance of the price data will also be presented." The price data for wheat and for flax for the years 1890–1939 are analyzed to show the variability by counties, by years, and by decades. The trends and the seasonality of the prices and the factors affecting the prices are discussed.

During the period wheat prices fluctuated from a low annual average of 30 ct. to a high of \$2.50 per bushel. The average annual flax prices ranged from less than 55 ct. to more than \$4.32 per bushel. "In 7 out of every 10 yr. studied, the South Dakota price of wheat has been less than \$1; during one-third of this period it has been less than 70 ct. The price of flax has fluctuated mainly between the limits of \$1 and \$2, but it was less than \$1 in 20 percent of the years and over \$2 in 25 percent of the years." The trends of both wheat and flax prices were upward during the 50 yr., but the rise was not so pronounced or sustained as that for industrial price levels. "In the case of neither wheat nor flax does the seasonal price appear large enough to justify increased storage operations by farmers if this involves building additional storage capacity." There was no appreciable difference in the earning capacity of wheat and flax in the areas of the State where both were grown.

Statistical analysis of the annual average f. o. b. prices of canned asparagus, 1925–26 to 1940–41, G. M. KUZNETS and H. R. WELLMAN (*California Sta. Mimeog. Rpt.* 80 (1942), pp. [1]+7, fig. 1).—This report presents the results of an analysis of the major factors influencing the average f. o. b. prices received for canned asparagus by canners in California from 1925–26 through 1940–41.

Deciduous fruit statistics as of January 1942, S. W. SHEAR (*California Sta. Mimeog. Rpt.* 79 (1942), pp. [2]+III+113).—This fourth compendium covers the same general field as that for January 1941 (*E. S. R.*, 85, p. 688).

El precio al por menor de los alimentos en Puerto Rico sigue aumentando en proporción mayor que en meses anteriores [The retail price of foodstuffs in Puerto Rico continues rising in greater proportion than in previous months] S. L. DESCARTES (*Agr. Eapt. [Puerto Rico Univ. Sta.]*, 2 (1942), No. 2, p. 8).—The author calls attention to increases in the retail price of foodstuffs in Puerto Rico in the period March 17 to April 14, 1942 (July 1939=100).

Effects of currency depreciation on prices, production, and foreign trade, 1929 to 1937, O. VAN DER MERWE ([*New York*] *Cornell Sta. Mem.* 242 (1942), pp. 47, figs. 6).—The author examines the effects of exchange depreciation on foreign trade. During the early years of the period 1929–37 the effects of currency devaluation on the value of the foreign trade of countries were largely obscured by price movements due to the depression. The gold value of both imports and exports declined more in the depreciated-currency than

in the non-depreciated-currency countries. With the growing complexity of modern economic organization, rigidities in the economic structure have become more and more important. The vital importance of balance in the internal price structure of countries has been brought out strikingly by the depression. The attempts at relieving depression and correcting price disparities and the role played by currency depreciation would indicate that the problem of managed currencies may become of even greater importance in the future.

Topics discussed included the effects of currency depreciation on foreign trade, business activity, and prices, and internal and external price relationships.

RURAL SOCIOLOGY

[**Rural life influences in Kentucky**] (*Kentucky Sta. Rpt. 1941, pp. 41-42*).—The studies reported are on the growth of Kentucky population, 1860-1940; community organization; and land-use trends in the eastern highland region, 1929-39.

[**Population questions in North Dakota**] (*North Dakota Sta. Bimq. Bul., 4 (1942), No. 6, pp. 3-21, figs. 2*).—The following articles are discussed: The Farm Population of North Dakota, by H. L. Walster (pp. 3-4); Farm Population Continues to Decrease, by J. P. Greenlaw, A. J. Kovash, and F. B. Daniel (pp. 4-7) (coop. U. S. D. A.); Fewer Farm People Again in 1940, by J. P. Greenlaw and R. Novak (pp. 7-11); "Sizing Up" the Small Town, by J. P. Greenlaw and D. M. Richardson (pp. 11, 14-17); and The Population of North Dakota, by H. L. Walster (pp. 12-13, 18-21).

Population redistribution in Louisiana, H. L. HIRT and T. L. SMITH. (La. State Univ.). (*Social Forces, 20 (1942), No. 4, pp. 437-444, figs. 4*).—"As is the case throughout most of the United States, the long-continued urbanization of the State is one of the most important changes in the population of Louisiana . . . During the 50-yr. period from 1890 to 1940 the urban population increased two and one-half times, from 283,845 to 980,439; in the meantime the rural population increased only 66 percent, from 834,743 to 1,383,441. Whereas in 1890 the urban population of the State comprised only 25.4 percent of the total, by 1940 it constituted 41.5 percent of all persons in the State. In the decade ending with 1940 the growth of the urban population was 17.6 percent as compared with only 9.1 percent for the rural population. . . . Population changes in the unincorporated territory of the State appear to bear an important relationship to the type of farming practiced. In the past decade, population gains were more pronounced in the self-sufficing cotton area of Washington and St. Helena Parishes and the Gulf coast dairy, truck, and fruit area [near] New Orleans. . . . The sugar parishes, also, experienced sufficient gains. Of all the wards in which farmers are primarily engaged in the production of sugarcane, three-fifths exhibited substantial increases in population outside of incorporated centers. The loss of open country population seems to have been most pronounced in the strawberry area and in the Red River delta. . . . This study showed that plantation sections lost heavily through migration, but that this loss could be more offset by the inward surge of families to take over farms on nearby cut-over new ground. . . . Decreases of population outside incorporated centers throughout the State were most frequent where Negroes were most numerous."

Statistical supplement to Volume and Characteristics of Migration to Arizona, 1930-39 (Arizona Agricultural Experiment Station General Bulletin No. 176), V. FULLER and E. D. TETREAU. (Coop. Ariz. Expt. Sta.

et al.). (*U. S. Dept. Agr., Bur. Agr. Econ., 1941, pp. 24*).—This is a presentation of survey methods and statistical tables, supplementing the bulletin previously noted (E. S. R., 87, p. 135).

Land settlement in the Willamette Valley, with special reference to Benton County, Oregon. V. W. BAKER and D. C. MUMFORD. (Coop. U. S. D. A.). (*Oregon Sta. Bul. 407 (1942), pp. 46, figs. 20*).—The study indicated that the "Food for Freedom Program" will probably result in increased production in the area of those agricultural products deemed necessary to feed the armies of the democracies. A back-to-the-land movement may be expected after the war. Opportunities for additional agricultural settlement in the Willamette Valley are rather limited, but there are greater opportunities for part-time farming than for off-the-farm employment. Regardless of the type of migration which takes place to Benton County and the Willamette Valley or the extent to which forces shape and change the pattern of settlement, it is deemed desirable to give some measure of direction and control to the movement.

The relation of the rural church to other rural organizations. H. HOFFSOMMER. (La. State Univ.). (*Social Forces, 20 (1941), No. 2, pp. 224-232*).—The author concludes that "the relation of the rural church to other social organizations and agencies may best be shown by considering the spatial relation of the church to other agencies and . . . the nature of the social interaction between the church and these other agencies."

The country weekly: A source of research data. C. F. REUSS. (Wash. Expt. Sta.). (*Social Forces, 20 (1941), No. 2, pp. 238-243*).—"An immense store of sociologically significant materials of particular interest to rural sociologists is contained in the files of American small town weekly newspapers. . . . This article describes some aspects of the rural community in operation as revealed by a detailed analysis of the news and advertising content of a representative sample of weekly newspapers. . . . One of the most interesting findings, and perhaps the most significant, concerns the place of the individual in rural society. It was discovered that the percentage of the total news space devoted to chronicling the activities of people and their personal affairs increased steadily with increasing size of town until the publication center attained a population of 2,500. Once that point was reached, however, the percentage of personal news began to decrease as the towns increased in size. . . . These related tendencies appear to warrant the conclusion that in the distinctively rural community interest centers in the individual per se, whereas in the distinctively urban environment the individual is of interest only insofar as he represents a group, a profession, or a class. . . . Through this analysis of newspaper content a fundamental difference between the primary group and the secondary group, between the rural community and the urban, has been emphasized. . . . Although by and large the proportion of both farm news and advertising decreased as the town became larger and thus farther distant from the soil, towns of 500-999 population provided a notable exception to the rule. Papers published in such centers contained more than twice as much farm news and advertising in proportion to total space as the next highest group of papers. . . . The volume of medicine and health advertising was of progressively less importance as towns became larger. In the smallest towns of less than 500 population, however, this type of advertising was of greater importance than any other type, exceeding even automotive and food advertisements in volume."

Emerging problems of the aged. P. H. LANDIS. (Wash. State Col.). (*Social Forces, 20 (1942), No. 4, pp. 460-467*).—"No definite place for the aged is made in the productive economic scheme, and they have only recently been cared for as a subsidized economic group. They are given little place in managing

the affairs of the world unless they happen to be vigorous enough to have retained an executive position . . . Since the old tend to be conservative, one would assume that the power of this group tends to exert a conservative influence in the general practices of governmental and economic institutions. . . . In making any adjustment to life the aged are working under the initial handicap of waning physical and mental energy. . . . The power of making quick decisions deteriorates in late maturity; information tends to increase up to the 50's, but its acquisition becomes more difficult . . . There are, of course, many examples of persons of extreme age making notable contributions to society. . . . Senescence, in many cases, is no doubt in part a state of mind. Ill health, economic insecurity, loss of social prestige, the shock of dropping out of the work world, enforced idleness, and other factors . . . may be so emotionally disturbing as to cause the individual to give up the struggle to advance or to be self-maintaining. . . . Even the institutions in which the old person is rooted often prove to be transient. . . . But the adjustments required within rural life cannot compare with the radical personality adjustments that are necessitated when an old person transfers from rural culture to urban culture, as some must do in going to live with children or in entering under the care of some public institution. . . . The old experience a radical transition in institutional participation. . . . More serious still is the frequent necessity of old people having to enter institutions with a regimen which is entirely new. Strangely enough, until very recently the special institutions provided for the aged were based on the assumption that the old person who needed institutionalization was a pathological type. . . . Certain new organizations of a voluntary type have indirectly made their contribution to the happiness of the aged. Undoubtedly, the numerous Townsend Clubs throughout the country have given the old a new focus of interest. . . . Social security programs are so new that it is not yet possible to know all of the adjustments that will be required by their initiation. That they will have far-reaching implications to many phases of American social and economic life is not to be doubted. . . . The aged require more extensive hospitalization, are a more dependent group, and are less productive than other adult groups in the population. . . . The demands of the old are rapidly increasing; their standards of living are rising. . . . It would not be surprising, if the old continue to function as an organized pressure group, to see movements put on foot during this generation to disfranchise those who reach retirement age, in order to protect the interests of other age groups in the population."

Acceptance of approved farming practices among farmers of Dutch descent, C. R. HOFFER (*Michigan Sta. Spec. Bul. 316 (1942), pp. 35, figs. 3*).—This study, based on the circulation in six communities of Dutch and English editions of a station circular on celery growing, supported the hypothesis that the rate and extent of acceptance of approved farm practices constitutes an indication of cultural change regarding agriculture among the celery growers of the State. Growers who read bulletins, attended meetings, and otherwise came in contact with the influences promoting scientific methods, adopted more recommended practices than others, because such contacts had produced the necessary changes or adjustments in their culture.

A sociological analysis of propaganda, C. R. HOFFER. (*Mich. State Col. (Social Forces, 20 (1942), No. 4, pp. 445-448)*).—The author states that "propaganda is the process of influencing attitudes in a veiled manner regarding matters of controversy within a society. . . . Its purpose is to influence attitude in a predetermined way in contradistinction to education designed to develop personality or the dissemination of information which may be designated to

create good will. . . . Since it is veiled and partisan in nature, propaganda retards the formation of intelligent public opinion and thus is a menace to democracy. Publics, however, are becoming increasingly aware of the nature and extent of propaganda and thus its dangers are greatly reduced."

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Workers in subjects pertaining to agriculture in land-grant colleges and experiment stations, 1941-42, B. T. RICHARDSON (*U. S. Dept. Agr., Misc. Pub. 480 (1942), pp. VI+176*).—This is the usual annual list (E. S. R., 85, p. 690) of the workers in agriculture and home economics in the land-grant colleges and experiment stations, the personnel of the Office of Experiment Stations, and the officers and standing and special committees of the Association of Land-Grant Colleges and Universities.

Selected list of American agricultural books (*U. S. Dept. Agr., Libr. List 1 (1942), pp. 29*).—This is a revision (E. S. R., 75, p. 562).

FOODS—HUMAN NUTRITION

Human nutrition [investigations by the Arizona Station] (*Arizona Sta. Rpt. 1941, pp. 69-74*).—This progress report (E. S. R., 85, p. 693) includes summaries of studies, for the most part representing an extension of earlier work, on thiamin (vitamin B₁) metabolism in humans, including the description of a method for judging thiamin nutritional status and an application of the test to college students and rural housewives; thiamin metabolism in rats; the absorption of fluorine by foods cooked in water containing fluorine; and the mineral content of vegetables as related to the soils in which they grow, with data on the range in calcium, phosphorus, and iron content of carrots and lettuce.

[Foods and nutrition studies by the Florida Station] (*Florida Sta. Rpt. 1941, pp. 76-78*).—This progress report summarizes the results of studies, some of them in continuation of work noted earlier (E. S. R., 85, p. 691), by O. D. Abbott, M. R. Overstreet, and R. B. French on human dietary deficiencies in selected counties in Florida, with special reference to nutritional anemia in relation to composition of home-grown foods; by Abbott and French on the chemical composition and nutritive value of Florida honeys and royal jelly; and by French and Abbott on vitamin A activity of foods and on vitamin C in Florida fruits and vegetables.

[Food and nutrition studies of the Massachusetts Station] (*Massachusetts Sta. Bul. 388 (1942), pp. 69-71*).—Progress reports, for the most part representing an extension of earlier work (E. S. R., 85, p. 845), are given on research by H. S. Mitchell and A. W. Wertz on the vitamin requirements of older people; by Mitchell, G. M. Cook, and Wertz on the cause and control of nutritional cataract; and by F. Kinder and Mitchell, with the cooperation of W. S. Mueller, on the nutritive value of the iron of cocoa and iron-fortified cocoa mixtures.

[Food and nutrition studies by the Wyoming Station] (*Wyoming Sta. Rpt. 1941, pp. 21-22*).—This annual report (E. S. R., 85, p. 122) summarizes the progress made in studies on the losses of ascorbic acid in snap beans as affected by methods of handling before and after cooking and canning, on the storage and cooking losses of vitamin C in potatoes, and the reliability of pressure cooker gages, all by E. J. Thiessen, and on the basal metabolism of college men, by E. J. McKittrick.

Meals for many: For school, camp, and community, K. W. HARRIS and M. A. Wood (*N. Y. State Col. Agr., Cornell Ext. Bul. 477 (1942), pp. 320, figs. 62*).—

This publication has been planned to help inexperienced persons prepare and serve foods in large quantity, as for school lunches and camp and community meetings. The authors acknowledge help from resident staff members, students, and extension specialists in the departments of food and nutrition, economics of the household, and institution management of the college of home economics; home demonstration agents; homemakers; and directors of school lunchrooms and of camps. Many of the photographs have been supplied by commercial companies. The wealth of material included in the bulletin is presented under the general headings menus and menu planning; purchasing and using food economically; sanitation; the school lunch; camp-food service; community-meal service; canteen service; teas, buffet meals, and picnics; and food preparation and recipes. Of particular interest is a small section on canteen service in which are given the plans and equipment for a simple mobile kitchen built on a standard 1½-ton reconditioned truck and suited to the preparation and serving of various types of meal from a simple and complete meal for from 100 to 150 persons to a one-dish meal for from 600 to 650 persons.

Meat for thrifty meals, L. M. ALEXANDER and F. W. YEATMAN (*U. S. Dept. Agr., Farmers' Bul. 1908 (1942), pp. 11+46, figs. 19*).—This publication gives suggestions for selecting and cooking the cheaper cuts of beef, pork, lamb, and veal, and offers many recipes under the following classifications: Tender roasts; stuffings for roasts; braised steaks, chops, and pot roasts; stews in variety; ground meat in savory ways; gravies; sauces; quick dishes with leftovers and canned meat; sandwiches—hot or cold; soups and chowders; liver and other meat organs; and salads—hot or cold.

Palatability and histological changes occurring in New York dressed broilers held at 1.7° C. (35° F.), H. L. HANSON, G. F. STEWART, and B. LOWE (Iowa Expt. Sta.). (*Food Res., 7 (1942), No. 2, pp. 148-160, figs. 7*).—The dressed Leghorn broilers were spray cooled. The controls were eviscerated and placed in the oven within from 6 to 40 min. after chilling, and the remaining birds were stored at 35° for 40 min. to 118 hr. before evisceration and cooking. The cooked chicken was scored for aroma, flavor, tenderness, and juiciness, and sections of three leg and two breast muscles were examined histologically. One control bird, held for 118 hr., was used for histological studies of the raw muscle. The first decrease in aroma and flavor scores occurred after 40 hr. of storage. These scores tended in general to decrease with increase in the storage time before cooking. Muscles in rigor when taken from the oven were rubbery and tough. The breast muscles increased rapidly in tenderness until approximately 3 hr. of storage prior to cooking. With longer storage there was a continued gradual, but slight increase in the tenderness. In general thigh muscles were less tender than those from the breast and required about 42 hr. of storage to reach a degree of tenderness comparable to that attained by the breast muscles in 3 hr. The thigh was more juicy than the breast, due possibly to the presence of a greater amount of fat. Juiciness was unaffected by the time of storage.

"The greatest decrease in the desirability of the aroma and flavor of the liver occurred after 20 hours' storage. The aroma scores of the gizzard dropped after the same period of time, but the decrease in flavor of the gizzard occurred after only 3 hours' storage. Tenderness and juiciness of the liver and gizzard were unaffected by the length of the storage time. Microscopic studies of two breast muscles and three thigh muscles showed similar post-mortem changes occurring in each muscle, but the time required for the same degree of change varied considerably for each muscle. The first change was the appearance of the nodes and internodes characteristic of rigor mortis. Following the passing of rigor, there was a thinning of the cell contents at random points

in scattered muscle fibers. Then definite breaks appeared in the fibers. Finally there was a change of the striated to a granular type of structure over a relatively long area of the cooked fiber. These changes appear to be correlated with changes in tenderness of the muscles. The post-mortem changes occurred more slowly in the uncooked than in the cooked fibers."

Representative photomicrographs are presented.

The detection of bacteria in liquid egg-meats during processing, W. L. MALLMANN and E. CHURCHILL. (Mich. Expt. Sta.). (*Ice and Refrig.*, 102 (1942), No. 5, pp. 303-305, fig. 1).—The direct microscopic test described for detecting the incidence of bacteria in liquid eggs was developed as a quick procedure for checking the bacterial content during processing. The method involves the preparation of film slides and the subsequent staining of the dried film of constant thickness with an acid methylene blue stain. The bacterial content of egg meats can be determined at the plant in less than 30 min. after the samples have been collected. It is pointed out that this method is not a substitute for the plating technic, but is for use in control work only. The method was found applicable to whole eggs and yolks but was not satisfactory for egg whites.

Cooking properties of eggs processed in mineral oil, J. A. McINTOSH, R. TANNER, R. J. EVANS, and J. S. CARVER. (Wash. Expt. Sta.). (*U. S. Egg and Poultry Mag.*, 48 (1942), No. 6, pp. 345-347, 383).—The eggs tested were (1) fresh eggs, (2) eggs stored 10 days without processing, (3) eggs stored 5 mo. without processing, (4) eggs processed in mineral oil (for several seconds at 62°-72° F.) immediately after gathering and stored for 3 mo., (5) eggs processed noon and evening of the day gathered and stored for 3 mo., (6) eggs processed the morning after the day of gathering and stored 3 mo., and (7) eggs processed the morning of the third day after gathering and stored 5 mo. The eggs were poached and scored for flavor, texture, color, and appearance, and certain physical measurements were made on the raw eggs.

In cooking qualities and most of the physical measurements the fresh eggs scored highest, and the 10-day-old eggs stored at 40°-50° ranked second in most cases. The eggs processed the second day and stored for 3 mo. approached those stored for 10 days without processing in the matter of cooking quality, appearance when broken, and volume and stability of the beaten whites. Processed eggs when boiled were more difficult to peel than nonprocessed ones. pH determinations indicated that processing tended to retard the decrease in acidity that normally takes place as eggs age. "The results of this study indicate that the best time to process eggs is the day after gathering. Eggs processed immediately, noon and evening of the day gathered, or the third day after gathering were not as good as those processed the day after gathering, but were considerably better than eggs stored 5 mo. without processing."

Frozen eggs, J. G. WOODROOF. (Ga. Expt. Sta.). (*Ice and Refrig.*, 102 (1942), No. 1, pp. 62-64, figs. 4).—The preparation of eggs for freezing, whether for commercial handling or for locker stores, and the storage and utilization of frozen eggs are discussed briefly, and the results of baking tests are reported. In these tests, angel, gold, and butter cakes made with frozen whites, yolks, and whole eggs, respectively, were scored in comparison with similar cakes made with fresh eggs. "It was shown from this study that frozen eggs are highly acceptable for baking cakes. In every case except one the cakes made from frozen eggs scored as high or higher than those made from fresh eggs. It was also shown that frozen whole eggs with 3 percent glycerin gave a smoother, finer, more even grain than either fresh eggs or frozen eggs without the glycerin. From 1 to 3 percent salt in the frozen eggs markedly increased the flavor of gold and butter cakes."

Frozen eggs: Their suitability for cake baking, J. G. WOODROOF. (Ga. Expt. Sta.). (*Bakers Digest*, 16 (1942), No. 7, pp. 134, 139).—Essentially noted above.

Quality in rice, A. SREENIVASAN (*Empire Jour. Expt. Agr.*, 9 (1941), No. 35, pp. 184–194).—This summary paper, based on recent studies of the author and other investigators, is concerned with the changes in the chemical composition of rice due to (1) varietal, cultural, and environmental differences and (2) polishing, parboiling, and cooking; and with the interrelation of composition and nutritive value of rice. Seventy-one references are cited.

Nutritive value of the protein and mineral constituents of rice varieties, A. SREENIVASAN (*Cereal Chem.*, 19 (1942), No. 1, pp. 36–47, figs. 2).—Six varieties of unpolished rice (grown in India) analyzed for protein, ash, P_2O_5 , and CaO content were powdered and autoclaved and used separately with supplements of cod-liver oil and marmite extract in feeding tests with rats. The rice constituted the only source of protein and minerals in the rations. Growth rates were found to be essentially related to the protein and mineral contents of the rations, as indicated by the growth curves and the correlation shown by means of a regression equation. Growth rates, which decreased after about 2 mo., were caused to increase again by supplements of casein given at that stage; the resulting increase in growth was again proportional to the nitrogen and mineral contents of the rices. The weekly average growth rates of the rats increased when a supplement of phosphate-free salt mixture was given, but differences due to varieties were still of the same order. When the protein content was adjusted to the same level in two of the diets by the requisite additions of purified rice protein, it was observed that the growth rate was greater with the variety of rice containing the greater percentage of phosphorus. The significance of the observations in relation to the nutritive values of the protein and mineral constituents of rice varieties and the availability of phytin in rice is discussed.

Nutritive value of the protein and mineral constituents of dry and wet cultivated rices, A. SREENIVASAN and V. SADASIVAN (*Cereal Chem.*, 19 (1942), No. 1, pp. 47–55, figs. 3).—A study was made of the chemical composition (moisture, protein, ether extract, ash, and P_2O_5) and the nutritive value of the protein and mineral constituents of three different rice varieties grown under (1) irrigated transplanted, (2) irrigated broadcast, and (3) dry broadcast conditions. Irrigated rice, irrespective of variety, was found to be richer in protein (9.06–10.77 percent) and ash (1.314–1.474 percent) than dry cultivated rice (7.87–8.35 percent protein; 1.236–1.334 percent ash). Of the irrigated rice, that which was transplanted contained higher percentages of these constituents and a lower percentage of fat than did the broadcast rice.

“In experiments on the growth of young albino rats fed with the different rice samples as the sole source of proteins and minerals, it was found that dry cultivated rice was least nutritious compared to wet cultivated, transplanted rice. Irrigated broadcast rice was intermediate in nutritive value between dry and irrigated, transplanted rices.”

Digestibility and biological value of whole wheat breads as compared with white bread, J. R. MURLIN, M. E. MARSHALL, and C. D. KOCHAKIAN (*Jour. Nutr.*, 22 (1941), No. 6, pp. 573–588, fig. 1).—Ten healthy male subjects averaging 29 yr. of age received 2,914 calories daily, 4.8 percent of these being furnished by protein, 48.6 percent by carbohydrate, and 46.6 percent by fat. Egg as the standard protein furnished 80 percent of the nitrogen for 6-day periods which alternated with like periods on bread as the source of this fraction. Twenty-four-hr. urines were analyzed on the last 4 days and feces (composite) for the full period. The three white breads gave true digestibility values for the proteins of from 98.3 to 99.4 percent and biological values of from 74.6 to 79.8 percent on the basis of 100 percent for egg proteins; digestibilities of the pro-

reins in three whole-wheat (including "peeled wheat") breads ranged from 92.8 to 94.9 percent and biological values from 77.8 to 81.0 percent; corresponding values for a whole-wheat cereal biscuit were 85.2 and 81.6 percent. The higher biological values were associated with those breads made with high vitamin yeast. In certain periods when extra vitamin B complex was eaten with the breads, the biological values of the proteins seemed to be improved.

Apparent digestibility of carbohydrates, fats, and "indigestible residue" in whole wheat and white breads, R. R. SEALOCK, D. H. BASINSKI, and J. R. MURLIN (*Jour. Nutr.*, 22 (1941), No. 6, pp. 589-596, fig. 1).—The plan of the experiment, the composition of the diet, and the breads used were the same as those in the previous study noted above. Total carbohydrate, fat, lignin, hemicellulose, and cellulose were determined in food and feces by methods noted. "The apparent digestibility of carbohydrates varied from 97.6 to 99.8 percent and of fat from 95.7 to 97.4 per cent. No significant difference between the results obtained with white breads and whole-wheat bread was found. It may be concluded that under the conditions of these experiments, in which the diet furnished approximately adequate calories for maintenance of weight of each subject, the higher indigestible residue of the whole-wheat products does not interfere with the digestion and absorption of carbohydrate and fat. The indigestible residue exhibited an apparent digestibility of 29.2 to 76.3 percent. The white breads gave the higher values, 68 to 76 percent, and the whole-wheat products the somewhat lower values of 55 to 62 percent."

Honey and corn syrup for cakes will save sugar for preserving fruit; recipes given, W. E. PYKE (*Colo. Farm Bul. [Colorado Sta.]*, 4 (1942), No. 3, pp. 10-13, fig. 1).—Recipes adapted for high altitude baking of cakes and employing strained honey and corn sirup in place of cane or beet sugar have been built up upon experimental tests in the station altitude laboratory. The cake formulas, deliberately kept on the economy side, are variations of the same basic yellow butter-type cake formula. This formula is given, with indications of adjustments that must be made at various altitudes in the amounts of liquid (milk), eggs, and baking powder, and with indications of the proportions of ingredients to be used in varying the basic recipe to give spice, ginger, chocolate-spice, and devil's food cakes. The method of mixing is also outlined.

Vegetables and fruits in relation to human nutrition in wartime, P. B. MACK ET AL. (*Pa. State Col. Bul.*, 36 (1942), No. 28, pp. [2]+54, figs. 22).—This publication, prepared by the nutrition subcommittee of the advisory victory garden committee of the Pennsylvania State Council of Defense, contains a preface, by A. C. Marts; a brief summary under the title *The Nutritional Ledger* of the findings to date of the Pennsylvania mass studies in human nutrition, showing the principal deficiencies in the diet of various population groups in the State; a discussion of the specific contribution of vegetables and fruits to the diet, with a table of the content of protein, minerals, and vitamins in average servings of common vegetables and a more detailed table condensed from a publication of the Philadelphia Child Health Service of the nutritive value of common vegetables and fruits; papers by W. B. Mack entitled *More Vegetables for the Duration and Afterwards* and *The Victory Garden Program*; and excerpts from various publications of the Ellen H. Richards Institute under the title *How Good Is Our Nutrition?* Suggestions for posters and displays for promoting victory gardens and directions for preserving the victory garden products are included.

Firmness of canned fruits and vegetables (*Kentucky Sta. Rpt.* 1941, pp. 31-32).—This progress report indicates that calcium chloride added in canning, at levels of from 0.05 to 0.09 percent, improved the texture of rhubarb, plums,

and raspberries by increasing the firmness of the canned fruit; the texture of asparagus, gooseberries, or strawberries was not affected.

Preservation of fruits and vegetables by freezing in refrigerated locker plants. H. H. PLAGGE and B. LOWE (*Iowa Sta. Bul. P46, n. ser. (1942), pp. 485-528, figs. 8*).—This bulletin presents information on the selection, preparation, and utilization of fruits and vegetables preserved under frozen food locker systems. The recommendations are based on investigations carried out over a 4-yr. period in which preparation and processing was done on a small scale in a kitchen laboratory to simulate home conditions. The methods described were found to yield frozen products of excellent quality. It is pointed out that the information is not intended as a guide to commercial packing of frozen products, and that the recommendations are applicable most specifically to Iowa-grown fruits and vegetables. The material presented covers equipment for preparing fruits and vegetables for freezing; kinds and varieties of fruits and vegetables for freezing; selection as to maturity, condition, and quality; preparation; packing (with reference to containers and the use of brine, sugar, and sirup); labeling of packed products; freezing; storing; utilization of frozen fruits and vegetables; handling of the frozen products in the home; and cooking the frozen fruits and vegetables with regard to particular uses and the conservation of food nutrients.

Frozen fruit and vegetable research indicates desirable new products for lockers. H. H. PLAGGE and B. LOWE. (*Iowa Expt. Sta.*). (*Ice and Refrig., 102 (1942), No. 6, pp. 357-361, fig. 1*).—Standard recommended varieties of vegetables harvested for the most part at the stage best for table use were used in this study. In preparation the greens were washed, the soybeans shelled by a mechanical hand sheller, and the root vegetables washed, pared, and diced. Except for the beets, which were cooked before paring and dicing, the prepared vegetables were blanched for 2 min. (parsnips 3 min.) in boiling water, cooled immediately, drained, and packed into glass jars (which were then sealed airtight) and frozen rapidly. After 24 hr. in the freezer, the products were transferred to lockers held at 0° F. After from 5 to 10.5 months' storage, the products were cooked and scored by a panel of judges. Of the greens, Swiss chard, beet leaves, New Zealand spinach, kale, and spinach yielded excellent frozen products; mustard and turnip greens were only fair to good in quality, due to being somewhat overgrown when selected. Beets, turnips, and kohlrabi yielded products excellent in appearance, texture, and flavor, and closely resembling the cooked fresh vegetables. The parsnips were rated good, but were somewhat bitter, possibly because of being slightly mature. The soybeans were very satisfactory as to texture, color, and flavor.

Fresh pineapple (Red Spanish variety), as purchased on the Iowa retail market, was packed in 30-, 40-, and 50-percent sirups, in a 3+1 sugar pack, and in water; new hybrid plums, hardy under midwest conditions, were packed in 60-percent sirup and 3+1 sugar. These were frozen and stored, the pineapple being scored after 10 mo. and the plums after 8 mo. The pineapple was found to be one of the best of frozen fruits with respect to preservation of color, texture, flavor, and aroma; the 30- and 40-percent sirup packs were the most desirable as to sweetness. The plums, cooked for 5 min. before judging, retained their rich, tart, fresh flavor and bright color and were considered very desirable.

Microscopic studies of tissue of frozen fruits and vegetables. M. J. COX and M. M. MACMASTERS. (*Ill. Expt. Sta.*). (*Food Res., 7 (1942), No. 2, pp. 135-139, pls. 2, fig. 1*).—A number of products were frozen (1) at about -31° C., the temperature used in many locker plants, and (2) on solid CO₂, at about

—76°. Asparagus frozen by the former method showed a great deal of cellular break-down, while that frozen on solid CO₂ was a very acceptable product. The cell structure of whole strawberries and sliced peaches was much better preserved by freezing on solid CO₂ than by freezing at —31°.

Peaches were also frozen under air, CO₂, or N₂ at 30 lb. pressure in order to increase the amount of gas within the cells. Samples thus frozen showed on the whole no more cell rupture, and in some cases even less, than those not subjected to this treatment. This behavior is interpreted to indicate that dissolved gases which are forced out of solution by freezing are in no way responsible for cell rupture, but that this is brought about entirely by ice crystal formation. The color and texture of the peaches frozen in an atmosphere of N₂ were very well preserved even in the absence of sirup. The fruit frozen under CO₂, although less desirable than that frozen under N₂, was an acceptable product, while that frozen in the presence of air was very poor.

Stretching the sugar ration for frozen foods, J. D. WINTER. (Minn. Expt. Sta. et al.). (*Quick Frozen Foods*, 4 (1942), No. 11, pp. 23, 29, fig. 1).—Experiments initiated in an attempt to find a way of eliminating fondantlike recrystallization of sugar that sometimes occurs in a product during freezing storage showed that the problem could be solved by replacing with corn sirup (the crystal white, enzyme-converted type) about one-fourth to one-third of the cane or beet sugar ordinarily used. The effect of the corn sirup was to cause the sugar to crystallize in very fine crystals which readily dissolved when the fruit was thawed. Even larger proportions of corn sirup—up to 50 percent of the sugar ordinarily used—could be used in frozen fruits without noticeably affecting the flavor or quality of the product. The corn sirup substitutions were made on the dry weight basis, it being considered that the enzyme-converted sirup as packed for the market contained about 25 percent moisture. It was also found that a light, mild-flavored honey could be used to replace some of the cane or beet sugar; the honey, being sweeter than corn sirup, could be used in replacement on a pound to pound basis without allowance for moisture content. Specific recommendations are given concerning the use of corn sirup (and in some cases honey) in preparing strawberries, raspberries, peaches, blueberries, and cantaloups for freezing and frozen storage.

Iron content of potatoes as influenced by cooking method, M. F. PFUND and H. W. NUTTING. (Cornell Univ.). (*Food Res.*, 7 (1942), No. 3, pp. 210-217).—New York State Smooth Rural potatoes, grown under known conditions, were used in this study, which is described in detail as to methods of preparation, cooking, sampling, and analysis. Iron was determined, with great care to prevent contamination, by the o-phenanthroline method by a procedure representing an adaptation of the method of Saywell and Cunningham. Certain samples were analyzed for ionizable iron by a modification of the procedure of Sherman et al. (E. S. R., 73, p. 416.) The flesh of raw potatoes, pared before testing, averaged 0.81 mg. of iron per 100 gm. The flesh of potatoes steamed after paring and of those boiled whole and peeled after cooking contained similar amounts (as calculated back to the raw basis). Significantly lower values (0.72-0.73 mg. per 100 gm.) were obtained, however, for pared potatoes that had been boiled whole, boiled in quarters, or soaked whole for 6 hr. previous to boiling. Potatoes cooked by these latter methods had apparently lost 10 percent of their iron during boiling. The iron content of baked potatoes removed from their thick skins amounted to 0.89 percent on the cooked basis; this high value was apparently due to loss of moisture during baking, since recalculation to the raw basis gave a value of 0.68 percent. High concentrations of iron were found in the thick crusty skins of baked potatoes (1-2 mg. in

the skin of a potato weighing about 200 gm.). The total iron and ionizable iron content of potatoes were found to be similar. The addition of salt to the water in which the pared potatoes were boiled had no significant effect on the quantity of iron lost.

Blackening of cooked potatoes—properties of the pigment, H. W. NUTTING. (Cornell Univ.). (*Food Res.*, 7 (1942), No. 3, pp. 227-235, figs. 3).—In further investigation of the stem blackening of cooked potatoes (E. S. R., 87, p. 448), some properties of the pigments from the blackened and nonblackened potatoes were determined and compared with those of melanin prepared from the raw potatoes by mechanical separation from water extracts or by the tyrosine-tyrosinase reaction. A gray and a yellow pigment were obtained from water extracts from the discolored portions of the cooked potatoes by chromatographic adsorption on aluminum oxide; a similar yellow pigment was obtained from unblackened tubers. While the dark pigment could be removed from the blackened potato with water, acid, or alkali, it could be desorbed from the aluminum oxide only by treatment with acid or alkali. Acid extracts of either material were colorless, but cautious addition of alkali restored the dark color while excess of alkali resulted in a persistent yellow color; alkaline extracts were yellow or brown-yellow, but could be darkened by cautious addition of acid. Apparently, therefore, these two pigments were related. Treatment of nonblackening tubers or of darkened portions of the blackening tubers with ethyl alcohol yielded a yellow extract from which no yellow pigment could be crystallized, however. In the adsorption tests the adsorbed yellow pigment showed the flavone type color reactions, gave an intense yellow solution in sodium hydroxide, lost color in dilute acids but turned bright yellow in concentrated HCl, and gave a dark gray-green color with ferric chloride solution. The dark pigment from the blackened tubers was unlike the melanin, which was insoluble in water or organic solvents, unaffected by cold acids, and soluble in dilute alkali, from which it could be reprecipitated with acid. Moreover, the ultraviolet absorption spectra of the melanin and the dark pigment were not alike; the spectra of the dark and the yellow pigments, however, were similar although not identical.

Soils and fertilizer affect food value as well as acre-yield of turnip greens, L. McWHITER and M. GIEGER (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 7, pp. 7, 8).—Analyses of Seven-top turnip greens from the same seed source in different seasons showed marked variations in the calcium and phosphorus contents of the greens grown at five places. The greens grown on soil high in calcium and phosphorus were relatively high in both minerals. Of the fertilizer elements applied—N, P, Ca, and K—nitrogen had the greatest effect. The percentage amount of calcium in turnip greens was somewhat lessened by nitrogen fertilization of the plats, but the effect on the phosphorus varied in different places. The nitrogen fertilization so increased the yield (from three to eight times that on nonnitrogen plats) that the total amount of both calcium and phosphorus from the full harvest of the greens was increased roughly in proportion to the increase in yield. Moreover, the addition of nitrogen greatly improved the quality of the greens, making them more succulent and tender than the greens receiving no nitrogen. Thus, greens that are good sources of calcium and phosphorus can be produced on fertile soils that are high in both calcium and phosphorus.

Pickles and the national diet, F. W. FABIAN. (Mich. State Col.). (*Canner*, 94 (1942), No. 9, pp. 20-22).—Data are presented on the proximate composition and vitamin and mineral content of fresh cucumbers and six commercial types of cucumber pickles. That pickles are poor sources of minerals and vitamins

is indicated by the following values reported: Ca. 0.0114-0.0636 percent; P, 0.0161-0.0901 percent; Fe, 3.0-20.6 mg. per kilogram; Cu, 2.5-8.5 mg. per kilogram; vitamin A, 292.0-600.0 International Units per 100 gm.; vitamin B, 0.0-8.0 I. U. per 100 gm.; vitamin B₂, 10.0-17.0 Sherman-Bourquin units per 100 gm.; vitamin C, 40.0-200 I. U. per 100 gm.; and vitamin D, lacking (0.0).

Sanitization of beverage glasses, W. G. WALTER (N. Y. State Expt. Sta.). (*Jour. Bact.*, 43 (1942), No. 1, pp. 114-115).—A survey was conducted over a 2-mo. period to determine the nature of the bacterial flora occurring on beverage glasses in six taverns where three different sanitization procedures were employed. From the nature of the colonies developed on plates seeded from the glasses, it appeared that an alkyltrimethylbenzylammonium chloride rinse solution generally resulted in a more marked decrease in the number of organisms and the elimination of coliform types from the rims of glasses than did a similar treatment with cold water or the chlorine compounds available. Glasses dried with toweling had fewer organisms on the rims than those which were wet from dipping in chlorine and water.

Effect of tea on energy metabolism of children, J. WHITACRE (Tex. Expt. Sta.). (*Jour. Home Econ.*, 34 (1942), No. 3, pp. 187-192, fig. 1).—Children from 10 to 13 yr. old served as subjects in this study of their metabolic rate as determined under controlled conditions at intervals (1) after the ingestion of 300 cc. of chilled tea with added lemon juice and sugar, furnishing about 170 calories and 0.03 gm. of caffeine and (2) after the ingestion of the same volume of chilled lemonade containing the same amount of lemon juice and sugar as did the tea. No attempt was made to influence the diet of the children in these tests except that those in one group in which the factor of tolerance was considered were given tea of the standard test strength for a week or more preceding the tests. The observed maximum increases, over the basal rate, in oxygen consumption following the ingestion of these beverages indicated that they induced about the same amount of stimulation in children. In no case was the stimulating effect of tea consistently greater than that of lemonade, and no evidence appeared of the establishment of any tolerance. It is concluded that caffeine in the iced tea of moderate strength caused little, if any, rise in the metabolic rate of the children studied. It is suggested that too much stress may have been placed heretofore on the bad effect of tea as far as its influence on energy metabolism is concerned.

Physical fitness of children from different economic levels in Chicago, M. C. HARDY, H. H. BOYLE, and A. L. NEWCOMB (*Jour. Amer. Med. Assoc.*, 117 (1941), No. 25, pp. 2154-2161, figs. 2).—Observations are presented on the incidence of certain health problems among over 6,000 children from 2 to 18 yr. of age (88 percent between 5 and 14 yr.) and about equally divided between the sexes. The children, all of whom were examined by pediatricians between January 1939 and October 1940, represented widely different income levels and various types of community areas in Chicago.

The findings as summarized indicate that the need for professional health services, such as medical and dental care, immunization against diphtheria, and vaccination against smallpox, was no less among children from nonrelief than from relief families, but that there was an association between low income and poor physical conditions, such as poor general health, underweight, poor posture, etc., which may not have required professional services. A larger proportion of Negro than of white children was in need of medical care, and this was also true of the general incidence of underweight and other signs of unsatisfactory physical conditions. Adequacy of the diet was directly associated with economic status, and the relation was noted more frequently

among the Negro than among the white children. The intake of fruits and vegetables was inadequate at all income levels.

"Evidence of the need for health supervision and health education at all economic levels is strikingly shown by the results of this study. Poor nutrition is clearly manifest in a composite of flabby muscles, underweight, pale mucous membranes, round shoulders, fatigue posture, bowlegs, knock-knees, flat feet, carious teeth, and inadequate diets. At no income level is the general health picture satisfactory, but at the low levels it is definitely unsatisfactory."

Geophagy (dirt eating) among Mississippi Negro school children, D. DICKINS and R. N. FORB. (Miss. State Col.). (*Amer. Sociol. Rev.*, 7 (1942), No. 1, pp. 59-65).—In this survey on the prevalence of dirt or clay eating, conducted in 11 Negro schools in a single county in Mississippi, great care was taken to avoid opportunities for coaching the children in the answers to the questions of whether or not they had eaten dirt during the 10- to 16-day period immediately preceding the study. The questionnaire contained 22 items, most of which were foods and beverages common to the locality, but with clay and dirt included twice. In the 207 acceptable replies obtained, 52 of the children gave yes as an answer for dirt eating, while 135 gave no as an answer both times. Seven children left the item blank both times and 13 were not consistent in their replies. The replies from the individual schools varied considerably. It is thought that these differences may have reflected the quality and quantity of clay banks in the different districts, as clay soils were the only kind of dirt eaten. Apparently the habit was locally known as dirt eating rather than clay eating, as 55 children left both questions concerning clay blank and the replies of the others were inconsistent. There appeared to be some relation between the dirt eating habit and the deficiency of the diet in iron-containing foods, but it is emphasized in the report that information on the quantity of iron-rich foods eaten is necessary before definite conclusions on this point can be drawn. "If the hypothesis of dirt eating to make up a diet deficiency should fail to be supported by further investigation, then we may have to conclude, as do most of the Negroes themselves, that dirt eating is simply a culture trait like dipping snuff or smoking."

The utilization of the calcium of carrots by adults, H. BREITER, R. MILLS, E. RUTHERFORD, W. ARMSTRONG, and J. OUTHOUSE. (Univ. Ill.). (*Jour. Nutr.*, 23 (1942), No. 1, pp. 1-9).—The seven adults participating in this study had served as subjects in the previously reported study of their utilization of milk calcium (E. S. R., 86, p. 416), the same basal period, in which the daily calcium intake averaged 270 mg., having served for the two test periods. During the period in which the carrot calcium was being studied, each subject consumed 700 gm. of carrots daily. This quantity of the vegetable furnished 202 mg. of calcium; the total daily calcium intake during the 35-day test period averaged 449 mg. During this period all subjects were in negative calcium balance, the daily net losses by subjects being 34, 72, 58, 74, 58, 49, and 121 mg., respectively. During the basal period the means of the negative balances in the above order were 67, 88, 80, 67, 120, 64, and 141 mg. "On the basis of differences between the intakes of these two periods and differences in the magnitude of the negative balances, the amount of carrot calcium utilized was computed; the values obtained were 17.6, 8.9, 12.9, 0.0, 33.5, 9.2, and 11.4 percent, averaging 13.4. Five of these seven subjects showed poorer utilization of the carrot calcium than they did of milk calcium in a previous study."

The biochemical defect in choline-deficient rats, H. P. JACOBI and C. A. BAUMANN. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 142 (1942), No. 1, pp. 65-

76).—Young rats kept for 7 days on a choline-free diet with or without a supplement of ethanalamine developed severe kidney hemorrhage, whereas this condition did not develop in rats receiving choline supplements. The choline content of rats with symptoms of "choline deficiency" was not reduced, but was slightly greater than that of the animals receiving choline. The hemorrhagic kidneys contained somewhat more choline than did the normal kidneys. No sex difference was observed in the choline content of young rats. It is concluded, therefore, that the hemorrhagic kidneys were due to the lack of a methyl-containing essential other than choline itself. In other tests young rats were given diets in which the cystine was replaced by arachin, which is low in methionine and, therefore, furnished relatively few labile methyl groups. The choline content of these rats remained essentially normal; their weight decreased, however, and they developed kidney hemorrhages. The addition of choline to the arachin diet prevented the kidney lesions, but did not prevent loss in weight. Since choline was effective in the absence of adequate dietary methionine, it was evident that methionine was not the methyl compound whose absence caused kidney lesions. Rats on a synthetic diet free of choline grew to maturity and reproduced.

Domestic water and dental caries.—III, Fluorine in human saliva, F. J. McCLURE (*Amer. Jour. Diseases Children*, 62 (1941), No. 3, pp. 512–515).—Parafin-stimulated saliva from normal adults living in areas where the drinking water contained no fluorine was found to average about 0.10 p. p. m. of fluorine. Specimens of saliva obtained from school children in Amarillo, Tex., where there were from 3.8 to 4.0 p. p. m. of fluorine in the drinking water, averaged slightly above 0.10 p. p. m., and pooled specimens of saliva collected from subjects of epidemiological studies of dental caries (E. S. R., 82, p. 713) in various cities in which the fluorine in the drinking water varied from 0.0 to 1.8 p. p. m. also contained about 0.10 p. p. m. The fluorine content of these latter samples showed no consistent effect of the levels of fluorine in the drinking water. "No conclusions appear to be justified at this time with regard to the significance of the quantity of fluorine which is normally present in saliva. Any function which this normal quantity or any slight excess above normal may have as a partial preventive of dental caries remains to be demonstrated. More data are needed also to establish any relation between the fluorine content of the drinking water and the resulting excretion of fluorine in the saliva."

A study of the relationship of oral *Lactobacillus acidophilus* and saliva chemistry to dental caries, F. A. ARNOLD, JR., and F. J. McCLURE (*Pub. Health Rpts. [U. S.]*, 56 (1941), No. 30, pp. 1495–1514, figs. 3).—From observations on 127 white school children living in Arlington, Va., it was found that a close correlation existed between dental caries activity, measured by repeated clinical examination, and the number of *L. acidophilus* organisms in the saliva. Data on total solids, organic matter, ash, total nitrogen and nitrogen fractions, pH of isoelectric zone, and oxygen consumption of stimulated saliva obtained at 2- and 3-mo. intervals were found to bear no relation to the numbers of *L. acidophilus* in the saliva or to the degree of caries activity as determined by clinical examination.

The oral manifestations of vitamin deficiencies, L. A. ROSENBLUM and N. JOLLIFFE (*Jour. Amer. Med. Assoc.*, 117 (1941), No. 26, pp. 2245–2248).—This address includes, in addition to a description with references to the literature of oral lesions attributable to deficiencies of ascorbic acid, nicotinic acid, and riboflavin, a case history demonstrating the progressive production of characteristic glossitis in a patient maintained on a diet low in the vitamin B complex supplemented by nicotinic acid, thiamin, ascorbic acid, and vitamin A, and the

rapid improvement of the tongue condition following the administration of pyridoxin (vitamin B₆). This condition has been noted among a number of patients treated with nicotinic acid and riboflavin.

Vitamin content of green snap beans. Influence of freezing, canning, and dehydration on the content of thiamin, riboflavin, and ascorbic acid. K. T. FARRELL and C. R. FELLERS. (Mass. Expt. Sta.). (*Food Res.*, 7 (1942), No. 3, pp. 171-177).—Green snap beans of the Bountiful variety grown on plats at the Massachusetts Experiment Station were picked throughout the tests at the same degree of maturity. They were assayed for thiamin by the vitamin B₁ rat-assay method of Booher and Hartzler (E. S. R., 83, p. 131), for riboflavin by the rat-growth method of Bourquin and Sherman (E. S. R., 66, p. 410), and for ascorbic acid by the procedure of Mack and Tressler (E. S. R., 78, p. 154). Quick freezing when preceded by 2 min. of blanching in boiling water conserved the thiamin, riboflavin, and ascorbic acid in the snap beans to the highest degree of all the processing methods. The importance of the blanching process in the conservation of the vitamins was indicated by the decidedly lower values obtained for the products frozen without preliminary blanching. The frozen beans lost a total of 22 percent of their thiamin content, no appreciable amount of their riboflavin, and about 47 percent of their ascorbic acid upon storage for 12 mo. at -4° F. Canning (in glass or tin and with preliminary blanching) caused moderate losses of thiamin (10-18 percent), little or no loss of riboflavin, and about a 75-percent loss of ascorbic acid; after storage for 12 mo. the loss of thiamin increased to about 45 percent, but there was little further loss of either riboflavin or ascorbic acid. About 30 percent of the thiamin and riboflavin and 50 percent of the ascorbic acid of the canned product were present in the liquid portion. The beans lost but little of their thiamin and riboflavin upon dehydration and subsequent long storage. Ascorbic acid, however, was almost totally destroyed by dehydration. The dehydrated beans, soaked 24 hr. and cooked, showed losses of thiamin and riboflavin amounting to 45 and 33 percent, respectively. There were very small or no losses of these vitamins in cooking the fresh frozen or canned beans, but ascorbic acid losses amounted to 24, 12, and 6 percent, respectively.

A compilation of the vitamin values of foods in relation to processing and other variants. L. E. BOOHER, E. R. HARTZLER, and E. M. HEWSTON (*U. S. Dept. Agr. Cir.* 638 (1942), pp. 244).—The vitamin A value, thiamin, ascorbic acid, riboflavin, and vitamin D contents of 290 foods, as recorded in the literature from the date of the establishment of the latest international standard for each vitamin through December 1940, are presented in this circular. The criteria for the inclusion of vitamin values were that the values should be expressed in International Units or absolute weight values, and that whether determined by biological or chemical means positive controls were included in the experiments. The data are arranged to show the effect of variety or species, geographical location, soil conditions or feeding practices, processing, and method of analysis on vitamin content.

Interaction of vitamins A and E. A. W. DAVIES and T. MOORE (*Nature [London]*, 147 (1941), No. 3739, pp. 794-796, fig. 1).—Further evidence (E. S. R., 85, p. 573) is given of the interaction of vitamins A and E in that (1) in rats restricted to a diet deficient in both of these vitamins the reserves of vitamin A accumulated through preliminary feeding of large amounts of this vitamin are exhausted more rapidly than in controls with the same initial stores but given *dl*- α -tocopherol during the depletion period, and (2) in rats during prolonged deficiency of vitamin E secondary deficiency of vitamin A develops, as shown by the disappearance of vitamin A from the liver. The teeth of these animals

also showed whiteness, generally held to be an effect of vitamin A deficiency, but which the authors are inclined to consider as a common result of deficiency of either vitamin A or vitamin E.

Non-crystallizable vitamin A, J. G. BAXTER, P. L. HARRIS, K. C. D. HICKMAN, and C. D. ROBESON (*Jour. Biol. Chem.*, 141 (1941), No. 3, pp. 991-992).—Free vitamin A in the concentrate resulting from saponification of the distillate from liver oil of the ling cod was found to be in two forms—that which could be crystallized from ethyl formate and that which resisted crystallization. This latter form, constituting 46 percent of the initial vitamin A, had an absorption spectrum similar to that of the crystalline preparation. Conversion factors (relative biological potencies) of the crystalline and noncrystalline preparations were determined as 2,600 and 1,500, respectively. These factors differ from the generally accepted value of 2,000 for the whole oil. It is suggested that the existence of more than one variety of vitamin A, spectrally identical but different in crystallizability and potency, if substantiated, would help to explain why natural oils have been found to have different conversion factors; these differences could be due to the presence of significantly different proportions of these two vitamin A's or inactive material absorbing sharply at 328 mμ.

The comparative physiologic value of injected carotene and vitamin A, J. G. and E. J. LEASE, H. STEENBOCK, and C. A. BAUMANN. (Wis. Expt. Sta.). (*Jour. Lab. and Clin. Med.*, 27 (1942), No. 4, pp. 502-510).—In vitamin A-deficient rats carotene injected intraperitoneally or subcutaneously in an aqueous colloidal suspension or in oil solution restored growth and cured ophthalmia. Although from 10 to 100 times as much was required as when administered orally, the effect was less prolonged, and there was little storage as vitamin A in the liver. Particles of unchanged carotene were found at the sites of the injection and in the liver, omentum, and in the lymph nodes of the peritoneal cavity. Much of the injected carotene could not be traced. In contrast with these findings, vitamin A was utilized about as effectively when injected as when given orally. Aqueous colloidal preparations were utilized to a somewhat greater extent when injected and oil solutions when given orally. In contrast with carotene, most of the injected vitamin A accumulated in the liver rather than at the site of injection.

The effect of dibenzanthracene, of alcohol, and of other agents on vitamin A in the rat, C. A. BAUMANN, E. G. FOSTER, and P. R. MOORE. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 142 (1942), No. 2, pp. 597-608).—The possibility that dibenzanthracene, previously shown to increase the rate of depletion of liver stores of vitamin A in the rat (E. S. R., 86, p. 422), might alter the distribution of vitamin A between the liver and other organs was tested by comparing the effects of this substance with other treatments likely to affect vitamin A storage, and by attempting to determine the fate of the fraction of vitamin A thus withdrawn from the liver.

In rats given enough vitamin A to promote good liver stores, the intraperitoneal injection of dibenzanthracene was followed by a shift to the kidneys of as much as 50 percent of the total body vitamin A as compared with not more than 5 percent in comparable uninjected animals. However, the increase in the vitamin A of the kidneys accounted for only about 10 per cent of the amount withdrawn from the liver. The effect of the dibenzanthracene was not counteracted by cystine or by high or low levels of vitamin E. Diets low in protein decreased the storage of vitamin A in the liver and increased the rate of its depletion. The ingestion of a 15-percent solution of alcohol increased the rate of depletion of vitamin A from the liver but to a less extent than dibenzanthra-

cene and did not increase the content of the vitamin A in the kidneys. The results are considered to be in harmony with the suggestion that vitamin A is held in the liver in the form of a protein complex.

Nicotinic acid in blood and in urine, B. D. KOCHHAR (*Indian Jour. Med. Res.*, 29 (1941), No. 2, pp. 341-350).—In continuation of previous work (E. S. R., 86, p. 868), this study was undertaken to observe the changes in the blood levels of nicotinic acid following a test dose and to determine whether or not continuous intake produces a condition of saturation in the blood. Urinary excretion of nicotinic acid was also observed at 3-hr. intervals in two individuals on a normal diet as well as fasting.

Oral administration of the nicotinic acid in 200- or 300-mg. doses produced a sudden temporary rise in the blood content of nicotinic acid, reaching a peak in 30 min. Continuous intake of nicotinic acid resulted in a slight gradual increase in the blood content, reaching a maximum which was not affected by prolonged intake. Corresponding to the rise in nicotinic acid in the blood, there was a sharp increase in urinary excretion, reaching a maximum within the first hour. Fasting subjects showed lowered excretion of nicotinic acid but an enhanced response to a test dose.

Studies on the metabolism of pantothenic acid in man and rabbits, P. B. PEARSON. (Tex. Expt. Sta.). (*Amer. Jour. Physiol.*, 135 (1941), No. 1, pp. 69-76).—In continuation of earlier work (E. S. R., 87, p. 600), the author has studied by the same methods the effect of massive doses of calcium pantothenate on its content in the blood and the rate of excretion in the urine of rabbits and humans.

In both species there was a rapid increase in the content of calcium pantothenate in the blood following the administration of a large dose, the extent of the increase appearing to depend on the size of the dose per unit of body weight and the mode of administration. The increase was higher on parenteral than on oral administration. There was also a definite relationship between the amount of pantothenic acid recovered in the urine and the maximum level in the blood. In three healthy male subjects, the urine collected at stated intervals for 26 hr. after the ingestion of 1 gm. of calcium pantothenate in aqueous solution at 6 a. m. just after the bladder had been emptied showed the highest content of the pantothenate in the sample collected at the end of the first 2 hr. This was followed by gradual decreases in the content of pantothenic acid in both blood and urine. The total recovery in 26 hr. amounted to only 7.8, 11.7, and 6.8 percent of the quantity ingested. In a rabbit given 400 mg. of calcium pantothenate orally, 52 percent was recovered in the urine within 24 hr. as compared with 74 percent when the same amount was given parenterally. The question as to what happens to the pantothenic acid not removed in the urine has not been answered. There was no evidence of toxicity following the administration of the large doses of pantothenic acid nor were there any unfavorable effects such as flushing of the skin.

Pantothenic acid in the nutrition of the rat, L. M. HENDEBSON, J. M. MCINTIRE, H. A. WAISMAN, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Nutr.*, 23 (1942), No. 1, pp. 47-58).—Following a review of the conflicting literature on pantothenic acid as the anti-graying factor, a series of studies is reported in which definite graying was produced in from 4 to 6 weeks in black and piebald rats on a synthetic ration deficient in pantothenic acid but containing presumably adequate amounts of thiamin, pyridoxin, riboflavin, nicotinic acid, and choline. The graying was prevented or cured by levels of pure calcium pantothenate above 40 μ g. per day. The rate of growth paralleled the pantothenic acid intake up to 80 μ g. per day. Although there was

no graying at higher levels, growth was improved by additions of 200 and 500 μg . In balance experiments very little pantothenic acid was excreted on amounts up to and including 80 μg . On the next higher level, 150 μg ., there was a marked increase, suggesting that the requirement of pantothenic acid lies somewhere between these two levels or at approximately 100 μg . Rats fed a heated grain ration supplemented with the B vitamins other than pantothenic acid showed graying, which was also prevented and cured with synthetic calcium pantothenate. A rusty graying occurred with copper deficiency and was cured by the addition of copper. Hydroquinone was ineffective in producing graying in rats on synthetic or milk rations, and *p*-aminobenzoic acid was entirely ineffective against the graying produced in rats by the synthetic ration used by the authors.

The succinoxidase system in riboflavin-deficient rats, A. E. AXELROD, V. R. POTTER, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 142 (1942), No. 1, pp. 85-87).—Determinations of succinoxidase activity of various tissues of rats on a riboflavin-deficient diet and of similarly depleted rats subsequently given riboflavin therapy showed that the dietary intake of riboflavin had a definite effect upon the succinoxidase content of liver tissue only. The results are taken as indirect evidence that one or more components of the succinoxidase system are flavoproteins.

Excretion of thiamin and its degradation products in man, H. POLLACK, M. ELLENBERG, and H. DOLGER (*Soc. Expt. Biol. and Med. Proc.*, 47 (1941), No. 2, pp. 414-417, figs. 3).—Using the method of Schultz, Atkin, and Frey (*E. S. R.*, 85, p. 727) for determining both thiamin and the pyrimidines in the urine, the authors studied the excretion of these substances in human subjects.

During a 10-day thiamin deprivation period in three subjects, two normal and one with ileojejunitis, the absolute amounts of pyrimidines excreted remained at approximately the same level but the free thiamin disappeared almost completely, the thiamin-pyrimidine ratio changing during the period from approximately 9:1 to 1:9. The test dose method of Dolger et al. (*E. S. R.*, 85, p. 702), applied at the beginning and end of a 10-day deprivation period, showed no differences in response even although free thiamin was absent from the urine at the time of the second test. This finding, together with the complete absence of any subjective and objective signs of vitamin B₁ deficiency, is thought to indicate that the determination of free thiamin alone in the urine is an index only of the dietary intake immediately preceding the measurement, but that the combined thiamin pyrimidine determination is capable of distinguishing between the low values of thiamin resulting from long or only temporary deprivation.

When a group of normal individuals was given the thiamin load test, over 60 percent of the yeast fermentation stimulating substance in the urine was free thiamin, while in a group of unselected hospitalized patients similarly tested 25 percent excreted more pyrimidine than thiamin. Tests on a single B complex-deficient subject during the period of daily intravenous injection of 100 mg. of thiamin hydrochloride showed an absolute increase in the excretion of both thiamin and pyrimidine but a decrease in the relative utilization of the thiamin, suggesting that frequent divided dosage of thiamin is preferable to a single massive dose.

Ascorbic acid content of four varieties of raw wines, M. KRAMER and G. H. SATTERFIELD. (Univ. N. C. et al.). (*Food Res.*, 7 (1942), No. 2, pp. 127-129).—Apple, peach, and black and white scuppernon wines were obtained from a North Carolina winery just prior to the finishing process, the wines at this time having been stored for a year or less. They were analyzed for ascorbic

acid by a method (described) which was essentially that of Tauber and Kleiner (E. S. R., 75, p. 588). No ascorbic acid was found in the wines.

Ascorbic acid content of seven varieties of muscadine grapes, T. A. BELL, M. YARBROUGH, R. E. CLEGG, and G. H. SATTERFIELD. (Univ. N. C. et al.). (*Food Res.*, 7 (1942), No. 2, pp. 144-147).—The varieties of grapes were grown in North Carolina in 1937, 1938, and 1939 seasons on the same type of soil and received the same fertilizer treatment. The fruits analyzed were firm and ripe (or green as desired) and of characteristic size for each variety. The ascorbic acid content, as determined by the method of Mack and Tressler (E. S. R., 78, p. 154), averaged 6.8 mg. per 100 gm. of the edible portion of ripe scuppernong grapes and from 4.1 to 5.5 mg. per 100 gm. of the Labama, Eden, Thomas, and James varieties. The Mish and Hopkins varieties contained negligible quantities, averaging 1.8 and less than 0.2 mg. per 100 gm., respectively. The green scuppernongs averaged 6.7 mg. of ascorbic acid per 100 gm. of edible portion. The skins of both the green and the ripe scuppernong grapes, containing, respectively, 20.2 and 18.4 mg. per 100 gm., had about three times the ascorbic acid content of the edible portion.

Losses of vitamin C during cooking of parsnips, E. J. BROWN and F. FENTON. (Cornell Univ.). (*Food Res.*, 7 (1942), No. 3, pp. 218-226).—Parsnips of the Hollow Crown variety grown in the Cornell University garden on fertilized sandy loam were dug in November, at which time they were placed under constant storage conditions (34°-35° F. and 95-100 percent humidity) until used in the tests, which continued at intervals into early March. The ascorbic acid content of the raw and cooked parsnips and the cooking water was determined by the dye titration method according to the procedure of Mack and Tressler (E. S. R., 78, p. 154). The raw parsnips analyzed in November, December, and January contained from 15 to 30 mg. of ascorbic acid per 100 gm.; during February and March only from 7 to 18 mg. per 100 gm. The relative distribution of the ascorbic acid in the different parts of the parsnip varied during the storage period. The parsnips, whole and unpeeled, peeled and cut in pieces (radially), and peeled and sliced crosswise were cooked by boiling, by steaming, and in two makes of pressure saucepans. Of these methods, boiling whole (unpeeled) and cutting in pieces and cooking in the pressure saucepan gave the best ascorbic acid retentions, 91 and 90 percent, respectively. "Parsnips steamed whole, unpeeled, and parsnips cut in pieces and boiled retained 86 percent of their original vitamin C. In both boiling and steaming the parsnips cooked whole, unpeeled, retained more vitamin C than did those which had been sliced or cut in pieces. Parsnips boiled in enamel and Pyrex pans retained more vitamin C than those boiled in stainless steel and aluminum pans, 84 and 81 percent, against 66 and 71 percent, respectively. Parsnips cut in pieces cooked 5 min. (overdone) in the pressure saucepan showed a retention of only 78 percent of the original vitamin C, whereas the retention was 90 percent at the done state after 2 minutes' cooking."

The influence of intermittent consumption of vitamin C on the development of scurvy, S. S. ZILVA (*Biochem. Jour.*, 35 (1941), No. 10-11, pp. 1240-1245, figs. 2).—The effect of intermittent rather than daily doses of ascorbic acid was tested on guinea pigs, both saturated and unsaturated with vitamin C at the beginning of the experiment. Daily doses of 2 and 5 mg. of ascorbic acid were adopted as standards, representing, respectively, the quantities necessary for preventing microscopic changes in the structure of the teeth and for bringing about deposition of traces of the vitamin in selective organs. A comparison was made of the effects of these doses when administered for 90 days to growing guinea pigs on a scorbutic diet daily, or in proportional amounts every

other day, every third day, and weekly. No significant differences were observed in the response of the different animals in growth and in protection against scurvy except in the case of those receiving 14 mg. of ascorbic acid once a week. The animals in this group showed definitely poor growth and slight symptoms of scurvy on post-mortem examination. There were no significant differences between animals saturated and unsaturated at the beginning of the experiment. When 85 mg. of ascorbic acid was given once a week, all of the animals grew well and were protected against scurvy.

Attempting to interpret these results in terms of human beings, using for reference earlier work of the author and reports of Crandon et al. (E. S. R., 86, p. 871), Fox (E. S. R., 86, p. 872), and others dealing with human subjects, the author suggests that 120 mg. of ascorbic acid every 30 days would be sufficient to protect man from macroscopic scurvy. In his opinion, as far as the civilian population of England is concerned, a general vitamin C deficiency at any time of the year need not be greatly feared.

Death of embryos in guinea pigs on diets low in vitamin E, A. M. PAPPENHEIMER and M. GOETSCH (*Soc. Expt. Biol. and Med. Proc.*, 47 (1941), No. 2, pp. 268-270).—In this preliminary report observations are recorded indicating that the guinea pig, like the rat and mouse, requires an abundant supply of vitamin E and that an inadequate intake results in the death of the embryo in the uterus. Previous failure to demonstrate this is attributed to the fact that guinea pigs on a vitamin E-low diet usually die of muscular dystrophy before sexual maturity. In the experiments reported enough vitamin E (from 5 to 10 mg. weekly) was given to prevent the development of muscular dystrophy, but this amount was insufficient to prevent resorption of the embryo in a large proportion of the cases. The authors had the assistance of C. Schogoleff.

Hemoglobin production increases with severity of anemia, F. S. ROBSCHKEIT-ROBBINS and G. H. WHIPPLE (*Amer. Jour. Physiol.*, 134 (1941), No. 2, pp. 263-267).—Dogs whose normal hemoglobin level was 20 or 21 gm. percent were brought to a severe or a moderate anemia level, 6 or 11 gm. hemoglobin percent, respectively, by the standard procedure used in the authors' laboratory. Hemoglobin production for a 2-week period was then observed in animals receiving diet supplements of liver, iron, or liver extract containing iron. The responses were similar for the different dietary factors and indicated that the production of new hemoglobin increased as the hemoglobin deficit (anemia) became more pronounced. The severe anemia level gave maximum stimulus for the production of hemoglobin, and the moderate anemic level gave hemoglobin production of approximately two-thirds of this maximum. The hemoglobin production, therefore, seemed to run parallel to the degree of anemia.

Hemorrhagic disease of the newborn, L. SNEDEKER (*Jour. Ped.*, 19 (1941), No. 1, pp. 1-15).—Data from case records of two hospitals over a considerable number of years are reported on 358 cases of hemorrhagic disease. Data on prothrombin levels were not available for any of these cases, but evidence in the literature is interpreted as indicating that prothrombin deficiency may be a cause of at least one form of hemorrhagic disease but not a consistent finding in all cases. The evidence available at present is considered insufficient to justify the conclusion that cases of hemorrhagic disease can be treated satisfactorily by the administration of vitamin K. "More data are needed on the prothrombin levels in normal and bleeding infants and on the effect of maternal diet, transfusion, and vitamin K on these levels. The relation between asphyxia and hemorrhagic disease of the newborn infant warrants investigation."

TEXTILES AND CLOTHING

Work clothes for women, C. L. SCOTT (*U. S. Dept. Agr., Farmers' Bul. 1905 (1942), pp. 16, figs. 14*).—The work clothes described and illustrated in this publication are designed for women doing active work in jobs of the factory, farm, and home. With the requirements of particular jobs in mind, the styles are planned with special features for safety, comfort, freedom of activity, and pleasing appearance. "These designs are released to patternmakers and the clothing trade as soon as they are completed. Most of the styles shown here are now on sale to the public through retail outlets either as commercial patterns or as ready-to-wear garments."

Clothing supplies for college girls and boys, A. BOWIE (*Miss. Farm Res. [Mississippi Sta.], 5 (1942), No. 7, pp. 1, 8*).—Sample inventories of clothing supplies of boys and girls attending two colleges in Mississippi showed the lowest total value for clothing on hand to be \$81 for any one girl and \$120 for any one boy; the maximum values, respectively, were \$529 and \$243. The amounts of money spent by the girls in 1 yr., as shown by their records, varied from \$12 to \$268; for the boys from \$40 to \$100. An average or typical list showing quantities and costs of clothing supplies is based on these and other college students' inventories and is presented, together with a minimum inventory list.

HOME MANAGEMENT AND EQUIPMENT

Family expenditures for education, reading, recreation, and tobacco: Five regions. Urban, village, and farm, D. MONROE, D. S. BRADY, M. Y. PENNELL, and M. H. COFFIN. (*U. S. Dept. Agr., Misc. Pub. 456 (1941), pp. [2] + V + 208, figs. 2*).—This report is one of the series from the consumer purchases study presenting facts concerning the incomes and consumption patterns of families in small cities and villages and on farms (*E. S. R.*, 87, p. 159). It is pointed out that education, reading, recreation, and tobacco occupy a position of secondary importance in the spending patterns of the groups of families at the various income levels in the five regions considered. In the Middle Atlantic and North Central regions, for example, formal education accounted for less than 2 percent of the total at all but one income level; reading for about 1 percent at all levels; tobacco for 1 or 2 percent; and recreation for from 1 to 4 percent at all but one level. These comparatively low direct outlays by families were made possible because of the schools, libraries, parks, and playgrounds maintained at public expense.

Housing in southern California, G. GRAY. (*Univ. Calif.*). (*Jour. Home Econ.*, 34 (1942), No. 5, pp. 300-301).—This paper presents a brief picture of the types of housing, particularly the contrasting extremes, and of homeownership in and around Los Angeles. Some of the hazards of ownership and some of the Federal housing troubles are pointed out. It is noted that in Los Angeles, as in many other areas, slum clearance is being conducted, while at the same time the basis for future slums is being laid through the operation of defense housing projects.

An analysis of pressure gasoline and pressure kerosene stoves, A. E. BARAGAR (*Nebraska Sta. Res. Bul. 127 (1942), pp. 63, figs. 39*).—One pressure kerosene and three pressure gasoline stoves built by nationally advertised manufacturers and obtained from open stock were used in the analysis of this type of appliance with regard to safety, efficiency, and general performance. Each stove differed from the others in type of cooking, type of oven, and

method of operation. All are described and illustrated by photographs of the stoves, the top burners, and the generator systems. The data obtained in the various tests are presented and discussed in sections on fuel supply (including tests with natural gas as well as gasoline and kerosene), products of combustion, cooking tops, and ovens. Among the practical points brought out in the final summary are the following:

"Even though on several occasions some stoves failed to function properly, it appeared that the greatest danger inherent with safe operation still remained the human factor of careless handling of gasoline around an open flame. . . . In some cases the percentage of carbon monoxide liberated by a burner was high, but in the extreme cases the concentration of CO in the room atmosphere would be such that a person could work for at least $1\frac{1}{2}$ hr. in a room having a volume of 1,000 cu. ft. where the air was changed once in 5 hr. and experience no perceptible effect from CO. . . . Less CO was found when a gasoline especially designed for stoves was used than when ordinary white unleaded motor fuel was used. (Thus from the point of view of completeness of combustion, it is probably better to pay the premium price for stove gasoline. . . . The flames at the burners on these gasoline and kerosene stoves cannot be turned low enough to prevent excessive evaporation without either the generator burner flame or the top burner flame extinguishing. When the burners were operating with the low inputs necessary just to maintain boiling, considerable odor was noticed and sometimes the products of combustion smarted the eyes. . . . While considerable temperature variations were found for the internal heat distributions in the ovens, actual baking tests, using bread, layer cakes, and baking powder biscuits, showed satisfactory oven performance." For differentiation of types and relative merits of each the original publication should be studied.

The steam pressure cooker, W. V. HALVERSEN. (Idaho Expt. Sta.). (*North-west. Sci.*, 16 (1942), No. 1, pp. 13-18, fig. 1).—The factors responsible for errors in the pressure gages of steam pressure cookers and the advantages of having the cooker equipped with a thermometer in addition to or in place of a pressure gage are discussed, and tables are given showing the errors in the pressure gages found in the examination of 38 pressure cookers used at different elevations from 1,000 to 6,000 ft., the proper gage pressures corresponding to specific processing temperatures at various altitudes, and the temperatures corresponding to the gage reading in pounds of steam pressure at sea level. A simple pressure gage tester is described and illustrated by diagram. "The seriousness of the condition of steam pressure cookers tested now in use can be judged by the following data: Of 146 pressure cookers tested, 30 pressure gages were accurate; on 63 gages the dials were so loose that they would shake back and forth over a range of 1 lb. or more without change in pressure; 31 fluctuated 2 lb. or more and 6 fluctuated 3 lb. or more; 87 were inaccurate to the extent that the dial also showed 1 lb. or more pressure than they should; 42 showed an inaccuracy of 2 or more pounds; 23 showed an inaccuracy of 3 or more pounds; 13 showed an inaccuracy of 4 or more pounds; 3 showed an inaccuracy of 5 or more pounds."

MISCELLANEOUS

Tables of orthogonal polynomial values extended to $n=104$, R. L. ANDERSON and E. E. HOUSEMAN (*Iowa Sta. Res. Bul.* 297 (1942), pp. 593-672, fig. 1).—A complete set of ξ values for $n=$ of Fisher and Yates (*E. S. R.*, 80, p. 572) to and including 104 is presented, with a brief simple description of the ξ method based on coded sugar prices from 1875 to 1936.

Fifty-second Annual Report [of Arizona Station], 1941, edited by R. S. HAWKINS (*Arizona Sta. Rpt. 1941*, pp. 99, figs. 5).³

Annual Report [of New Haven Station] for the year ending October 31, 1941, W. L. SLATE ET AL. (*Connecticut [New Haven] Sta. Bul. 452 (1942)*, pp. 35).³

Annual Report [of Florida Station], 1941, W. NEWELL ET AL. (*Florida Sta. Rpt. 1941*, pp. 207+V, figs. 26).³

Fifty-fourth Annual Report [of Kentucky Station], 1941, T. P. COOPER (*Kentucky Sta. Rpt. 1941*, pp. 55).³

Annual Report of the Massachusetts Agricultural Experiment Station, 1941, [F. J. SIEVERS ET AL.] (*Massachusetts Sta. Bul. 388 (1942)*, pp. 108, figs. 6).³

Annual Report of [Nevada Station], 1941, S. B. DOTEN ET AL. (*Nevada Sta. Rpt. 1941*, pp. 30, figs. 4).³

Fifty-first Annual Report of [Wyoming Station, 1941], J. A. HILL (*Wyoming Sta. Rpt. 1941*, pp. 47).³

Farm Research, [July 1, 1942] (*Farm Res. [New York State Sta.]*, 8 (1942), No. 3, pp. 16, figs. 16).—In addition to articles noted elsewhere in this issue, this number contains Doctor A. J. Heinicke Named Station Director (p. 1); Growth and Development of Locker Plants, by C. W. DuBois (pp. 5, 6); and Hudson Valley Laboratory in New Location, by R. W. Dean (p. 16).

Abstracts of Bulletins No. 596-609, Circulars No. 91-94, and other publications during 1941, A. D. JACKSON (*Texas Sta. Cir. 96 (1942)*, pp. 49).—In addition to abstracts of the station's own publications as indicated, this circular contains abstracts of articles contributed by members of the staff for publication elsewhere. Some of these have been previously abstracted or are noted elsewhere in this issue, but there are also abstracts of the following: Symposium on Research With Tomatoes in the South—Recent Progress in Breeding and Improvement, by S. H. Yarnell (pp. 19-20); Comparative Cooking Time and Tenderness of Meal Cooked in Water and in an Oven of the Same Temperature, by S. Cover (p. 24); and The Pantothenic Acid Content of Royal Jelly, by P. B. Pearson and C. J. Burgin (p. 26). A classified subject list of available station publications is appended.

List of Farmers' Bulletins that have been superseded and the Farmers' Bulletins or other publications superseding them (*U. S. Dept. Agr., 1942*, pp. [1]+12).

³ The experimental work reported is for the most part referred to elsewhere in this issue.

NOTES

Arkansas University and Station.—The resignations are noted of E. L. Barger, head of the department of agricultural engineering; Walter Massey, scientific assistant in the Cotton Branch Station; and Lorin E. Harris and Milton W. Sanderson, instructors in animal industry and entomology. Thomas C. Guthrie, scientific assistant at the Rice Branch Station, and Hilliard Jackson, research assistant in rural economics, have entered military service. Recent appointments include Dr. T. C. Liu as research assistant in plant pathology, J. R. Tatum as assistant professor of sociology and assistant sociologist, Lorraine Adelaide Williams as assistant professor of home economics, Dr. Edgar Martin as instructor in animal industry and assistant animal husbandman, F. D. Miner as instructor in entomology and assistant entomologist, Geneva Johnson as instructor in home economics, T. R. Moberg as assistant forest economist, and Clay R. Moore as scientific assistant in the Cotton Branch Station.

California University and Station.—The H. E. Metcalf orchid collection, containing 2,700 plants of 1,400 different varieties and species mostly from Central and South America, has been donated to the botany division of the College of Agriculture for use in research on plant physiology.

The dairy industry division of the College of Agriculture at Davis is offering a 2-weeks course to train men and women as milk testers. These testers are much in demand since milk plants have lost many employees to the armed services and war industries.

Dr. Murray R. Benedict, professor of agricultural economics and agricultural economist, has been appointed Federal rent administrator in the San Francisco Bay region.

Connecticut [New Haven] Station.—Dr. Albert E. Dimond, plant pathologist, has been appointed assistant professor of botany in the University of Nebraska.

Kansas College and Station.—The Kansas State College Research Foundation has been organized, with President F. D. Farrell as chairman of the board of nine directors. Its charter is said to follow closely those of like organizations at a number of land-grant institutions.

Dr. William H. Metzger, assistant professor of soils from 1932 to 1935 and subsequently associate professor, died July 7 at the age of 43 years. A native of Indiana, he received the B. S. degree from Purdue University in 1922, the M. S. degree from the Kansas College in 1927, and the Ph. D. degree from the Ohio State University in 1931. He had also held positions as assistant in soils in the Pennsylvania College from 1922 to 1923, as county agent in Kansas from 1923 to 1927, and as assistant agronomist in the Arkansas Station from 1927 to 1929.

Leave of absence to enter military service has been granted R. J. Doll, assistant professor of agricultural economics; R. B. Cathcart, assistant professor of animal husbandry, and Leo Petri, technician in zoology. John C. Crupper, Jr., forest nurseryman at the Fort Hays Substation, has been succeeded by Jewell Harrison. H. J. Haas, junior agronomist in charge of dry land agriculture investigations at the Garden City Substation, has been transferred to the Northern Great Plains Field Station at Mandan, N. Dak., and has been succeeded by Hugh G. Myers. Other appointments include Emery C. Swanson as assistant in milling industry and A. Weybrew and Charles Wagoner as assistant chemists.

INDEX OF NAMES

Abbe, E. C., 206.
 Abbie, A. A., 48.
 Abbot, C. G., 680.
 Abbott, E. V., 93.
 Abbott, O. D., 880.
 Abdul Wahid Khan, 98
 Abel, G. W., 65.
 Åberg, B., 784.
 Abraham, A., 495.
 Abt, A. F., 156, 460
 Acharya, B. N., 589.
 Ackert, J. E., 110.
 Adair, C. R., 377.
 Adam, W. B., 446.
 Adams, F. J., 609.
 Adams, G. A., 85.
 Adams, R. L., 23, 732, 868
 Adams, W. B., 524.
 Adamson, A. M., 97.
 Adelson, S. F., 136, 501
 Adler, S., 119.
 Adsuar, J., 213, 229, 386, 465,
 815.
 Afanasiev, M., 677.
 Afanasiev, M. M., 377, 536,
 812.
 Ahlgren, G. H., 368, 660
 Ahlgren, H. L., 98, 479, 483,
 504.
 Ahlquist, R. P., 504.
 Aicher, L. C., 792.
 Alkman, J. M., 182, 183, 191,
 212, 220, 226.
 Ainsworth, H. F., 588
 Aitken, T. H. G., 89
 Aitkenhead, W., 725
 Akesson, N. B., 725.
 Albaum, H. G., 31, 647
 Albert, A. R., 483, 504, 525,
 677.
 Albert, S., 499, 654, 655
 Albert, W. B., 378.
 Albertson, F. W., 86.
 Albiston, H. E., 571.
 Albrecht, H. R., 666, 740
 Albrecht, W. A., 22, 32, 186,
 347, 769, 772.
 Albright, W. P., 725.
 Alcock, A. W., 450.
 Alden, R. H., 654.
 Alderfer, R. B., 482.
 Alderman, W. H., 670.
 Aldrich, W. W., 522.
 Alexander, L. J., 690.
 Alexander, L. M., 881.
 Alexander, L. T., 185.
 Alexander, R. A., 851.

Alexander, T. R., 354.
 Alexopoulos, C. J., 486, 808.
 Alford, J. A., 33.
 Alfredson, B. V., 846.
 Alicata, J. E., 96.
 Allard, H. A., 204, 687
 Allardyce, J., 257.
 Allaway, H., 183
 Allbaugh, L. G., 283, 321
 Alldis, V. R., 181.
 Allen, D. I., 32, 666
 Allen, D. L., 545
 Allen, E., 654, 789
 Allen, E. A., 426
 Allen, F. W., 518
 Allen, G. S., 804
 Allen, H. R., 830, 775
 Allen, N., 378, 393
 Allen, N. N., 611, 704.
 Allen, P. J., 814.
 Allen, R. C., 64, 226, 543.
 Allen, R. W., 263.
 Allen, T. C., 528, 546
 Allinger, H. W., 59, 339.
 Allis, J. A., 120.
 Allison, J. B., 117.
 Allison, J. L., 819.
 Allison, R. V., 768
 Allmendinger, D. F., 372, 378
 Allred, C. E., 289, 294, 444.
 Allyn, R. B., 185.
 Almquist, H. J., 408, 838, 839.
 Almquist, J. O., 466.
 Altergot, W. F., 37.
 Altman, I., 609.
 Alstatt, G. E., 377, 680.
 Alvarez, L. A., 229.
 Alvarez García, L. A., 800
 Alvis, J. K., 725.
 Amdur, E., 172.
 Amos, J. M., 245, 393
 Andberg, W. G., 853.
 Anders, M. V., 859, 627.
 Andersen, E. M., 58, 791, 799.
 Anderson, A. K., 115, 569.
 Anderson, A. L., 209.
 Anderson, A. M., 512.
 Anderson, C. A., 135, 300.
 Anderson, D. B., 32.
 Anderson, E., 494.
 Anderson, E. O., 106, 847.
 Anderson, G. C., 703.
 Anderson, G. W., 403, 422, 854.
 Anderson, H. D., 397, 418, 421,
 554, 564, 610.
 Anderson, H. W., 385, 516,
 528, 540, 805.

Anderson, J. A., 182.
 Anderson, K., 32, 610.
 Anderson, K. A., 121.
 Anderson, K. L., 217, 485.
 Anderson, L. D., 821, 829.
 Anderson, M. S., 186, 344, 770.
 Anderson, N. J., 439.
 Anderson, O. W., Jr., 787, 833.
 Anderson, P. J., 527, 791, 796,
 805, 813.
 Anderson, R., 442
 Anderson, R. L., 898.
 Anderson, S. A., 694.
 Anderson, T. F., 643.
 Anderson, T. G., 563.
 Anderson, W. A., 186.
 Anderson, W. S., 370.
 Andes, J. O., 80.
 Andison, H., 90.
 Andrés, J. M., 359.
 Andrew, R. H., 513.
 Andrews, F. N., 47, 98, 860,
 501, 556, 655, 697.
 Andrews, F. S., 768, 791, 799.
 Andrews, J., 697.
 Andrews, J. S., 9, 112, 154,
 270, 475, 604, 621, 716, 750.
 Andrews, L. K., 678.
 Andrews, M. C., 338.
 Andrews, W. B., 52, 189, 660.
 Andross, M., 605.
 Andus, C. F., 682.
 Anker, D. L. W., 455.
 Ansbacher, S., 155, 606, 703.
 Anslow, W. K., 349.
 Anson, M. L., 32, 237.
 Anthony, C. H., 716, 858.
 Anthony, R. D., 513.
 App, B. A., 394.
 Appleman, M. D., 503, 666.
 Appling, J. W., 181, 305, 348.
 Arada, F. E., 337, 617.
 Arbuckle, W. S., 103.
 Archer, W. A., 527.
 Archibald, J. G., 842.
 Ardrey, W. B., 709.
 Armand, J. E., 97.
 Arms, R., 488.
 Armstrong, A. E., 836.
 Armstrong, G. M., 378, 807,
 Armstrong, W., 749, 886.
 Armstrong, W. H., 118, 420,
 558.
 Arndt, C. H., 378.
 Arnold, A., 12.
 Arnold, C., 659.
 Arnold, E. L., 187.

- Arnold, F. A., Jr., 890.
 Arnold, H. A., 125, 728.
 Arnold, L. J., 482.
 Arnold, P. T. D., 787, 842.
 Arny, A. C., 31.
 Arny, C., 289.
 Aronovsky, S. I., 169.
 Arrillaga, N. G., 180, 617.
 Arroyo, R., 165, 617, 800.
 Arthur, I. W., 283.
 Arthur, J. C., 160.
 Artschwager, E., 651.
 Artsikhovskaya, E. V., 780.
 Asdell, S. A., 47, 49, 361, 846.
 Asenjo, C. F., 229.
 Ashby, R. C., 583.
 Ashby, W., 573.
 Ashley, T. E., 221, 671, 728, 824, 863.
 Ashton, G. C., 701.
 Ashworth, U. S., 343, 640.
 Astbury, W. T., 650.
 Astrowe, P. S., 155.
 Asuyama, H., 72.
 Atkeson, F. W., 412.
 Atkins, S. W., 438.
 Atkinson, W. B., 600, 654.
 Atwood, S. S., 206, 652, 787.
 Aubert, P., 802.
 Auchter, E. C., 758.
 Auerbach, D. A., 863.
 Augustson, G. F., 248.
 Aull, C. M., 875.
 Aull, G. H., 435.
 Aune, B., 210.
 Austrian, R., 271.
 Avens, A. W., 827.
 Averna Sacca, R., 387, 542.
 Axelrod, A. E., 457, 698, 746, 894.
 Axley, J. H., 770.
 Axtmayer, J. H., 165.
 Ayyar, P. N. K., 400.
 Azariah, H., 120.
 Babb, M. F., 373.
 Babcock, E. H., 487.
 Babcock, M. J., 103.
 Baber, M., 312.
 Bachman, K. L., 582.
 Backenstose, D. L., 300.
 Badger, C. J., 482, 504.
 Badgett, W. H., 282.
 Badhwar, R. L., 86.
 Badri Nath Mohan, 302.
 Baerg, W. J., 252.
 Bagné, J., 496.
 Bahler, G. P., 554, 624.
 Bailey, A. J., 474, 475.
 Bailey, B., 608.
 Bailey, D. M., 367, 371.
 Bailey, E. A., Jr., 14.
 Bailey, E. M., 30.
 Bailey, I. W., 493, 525.
 Bailey, J. S., 800.
 Bailey, R. M., 58, 213, 220, 245.
 Bain, H. F., 224.
 Baines, R. C., 670.
 Bair, R. A., 21, 191.
 Balrd, A. B., 89.
 Balrd, F. D., 16.
 Baker, A. L., 360, 556.
 Baker, C. E., 668.
 Baker, D. W., 109, 851.
 Baker, F. S., 525.
 Baker, G. L., 17, 165.
 Baker, G. O., 632, 659.
 Baker, J. A., 115, 568.
 Baker, K. F., 94, 244, 692.
 Baker M. L., 209.
 Baker, O. E., 588.
 Baker, V. W., 878.
 Baker, W. A., 89.
 Bakke, A. L., 191, 212, 214, 446.
 Balbach, P., 512.
 Balch, R. E., 545.
 Balch, R. T., 170, 336.
 Baldinger, L. H., 180.
 Balduf, W. V., 822.
 Baldwin, H. I., 43.
 Baldwin, I. L., 612.
 Baldwin, J. T., Jr., 45.
 Baldwin-Wiseman, W. R., 767.
 Ball, E., 494.
 Ball, E. D., 827.
 Ball, W. S., 57.
 Ball, Z. B., 744.
 Ballard, L. A. T., 202.
 Ballinger, R. A., 201.
 Ballou, G. A., 168.
 Ballow, E. B., 296.
 Balls, A. K., 107, 337, 616, 617.
 Hamberg, R. H., 509.
 Bamford, R., 46.
 Banasik, O., 627.
 Bandemer, S. L., 274.
 Bane, L., 583, 608.
 Bang, F., 717.
 Bannan, M. W., 66, 495.
 Baragar, A. E., 464, 897.
 Barbee, O. E., 367.
 Barbella, N. G., 556.
 Barber, C. W., 571.
 Barber, E. M., 306.
 Bare, C. O., 822.
 Barer, A. P., 310, 455.
 Barger, E. L., 900.
 Barger, W. R., 580.
 Barham, H. N., 348.
 Barker, H. A., 340.
 Barkworth, H., 107.
 Barnell, H. R., 63.
 Barnes, D. F., 250.
 Barnes, F. W., 698.
 Barnes, H. F., 552, 820.
 Barnes, J. E., 466.
 Barnes, L. L., 99.
 Barnes, O. K., 794.
 Barnes, R. H., 744.
 Barnes, W. C., 371.
 Barnett, C. E., 702.
 Barr, C. G., 646.
 Barr, G. W., 130, 438.
 Barr, M., 157.
 Barr, W. L., 437, 584.
 Barre, H. J., 277, 580.
 Barrick, E., 697.
 Barrien, B. S., 203.
 Barron, N. S., 710.
 Barrus, M. F., 680.
 Bartell, F. E., 165.
 Barth, I., 601.
 Barthen, C. L., 16.
 Bartholdi, W. L., 221, 664.
 Bartholomew, E. T., 224, 522, 674.
 Bartholomew, W. V., 5, 636.
 Bartlett, J. W., 104, 208, 209, 410.
 Bartlett, K. A., 89, 255, 695.
 Bartlett, R. W., 584.
 Barton, J. R., 612.
 Barton, L. V., 32, 648.
 Barton-Wright, E., 399.
 Basinski, D. H., 8⁹⁴.
 Bass, A., 420.
 Basu, S., 22.
 Bateman, H. P., 573, 579.
 Baten, W. D., 785.
 Bates, E. N., 4.
 Bates, J. C., 358, 485.
 Bath, J. D., 650.
 Batson, F. S., 60, 150, 221.
 Bauer, C. D., 698.
 Bauer, F. C., 482, 503.
 Bauernfeind, J. C., 257, 400, 790.
 Baugh, L., 370.
 Baum, H. M., 316.
 Baumann, C. A., 698, 889, 892.
 Baumann, R. V., 297, 868.
 Baur, K., 343, 640, 816.
 Bausman, R. O., 283, 436.
 Baver, L. D., 196.
 Baxter, A., 198, 775.
 Baxter, J. G., 892.
 Bayfield, E. G., 338.
 Bayles, B. B., 667.
 Bayliss, M., 4.
 Bayliss, N. S., 679.
 Beach, W. S., 528.
 Beacham, L. M., 330.
 Beacher, J. H., 393.
 Beadle, B. W., 467, 616.
 Beadle, G. W., 208.
 Beale, O. W., 773.
 Beam, A. L., 842.
 Beamers, P. R., 712.
 Bean, L. H., 20.
 Bear, F. E., 342, 347, 433.
 Bear, R. S., 165.
 Beard, D., 424.
 Beard, F. J., 209, 256, 283, 803.
 Beard, J. W., 424.

- Beard, R. L., 95, 402.
 Beard, W. P., 578.
 Beasley, E. W., 197.
 Beasley, J. O., 206, 208.
 Beasley, R., 627.
 Beasley, R. P., 52, 120.
 Beath, O. A., 37.
 Beattie, H. G., 17.
 Beattie, J. H., 373.
 Beattie, M., 713.
 Beattie, W. R., 373, 515.
 Beatty, A. V., 31.
 Beatty, H. A., 391.
 Beauchamp, C. E., 783.
 Beaudette, F. R., 427.
 Benumont, A. B., 23, 24, 769.
 Beavens, E. A., 17.
 Bechdel, S. I., 114, 413, 562.
 Beck, A. B., 115.
 Beck, G. H., 412.
 Beck, J. V., 349.
 Beck, W. A., 780, 782.
 Beckenbach, J. R., 768, 799.
 Becker, C. A., 129.
 Becker, E. R., 245, 270.
 Becker, J. E., 460.
 Becker, R. B., 787, 842.
 Becker, W. B., 820.
 Beckley, V. A., 751.
 Beckman, H., 724.
 Beckord, O. C., 472.
 Becks, H., 362, 503, 789.
 Beckwith, C. S., 241, 401.
 Beddie, A. D., 196.
 Bedenbaugh, P. G., 836.
 Bedford, C. L., 372.
 Bedi, K. S., 232.
 Beeley, F., 390.
 Been, R. O., 294.
 Beers, H. W., 587.
 Beers, R. G., 294.
 Beeson, C. F. C., 395, 546.
 Beeson, W. M., 273, 616, 697, 709, 730.
 Begeman, L. H., 268.
 Bekker, P. M., 272.
 Belkengren, R. O., 358.
 Bell, C. E., 760, 768.
 Bell, F. C., 440.
 Bell, G. H., 51.
 Bell, R. W., 709.
 Bell, T. A., 895.
 Bellue, M. K., 57.
 Benbrook, E. A., 245, 718.
 Bender, C. B., 563, 660, 704.
 Bender, W. H., 27.
 Bendixen, H. A., 278, 279, 411.
 Benedict, M. R., 583, 900.
 Benedict, R. G., 118.
 Benjamin, D. M., 553.
 Benne, E. J., 189, 761.
 Bennett, C. A., 432, 581, 863.
 Bennett C. C., 878, 807.
 Bennett, E., 515, 760.
 Bennett, H. H., 122.
 Bennett, H. W., 366, 660, 699.
 Bennett, K. R., 130, 283.
 Bennett, L. J., 546.
 Bennett, S. H., 539.
 Bennetts, H. W., 568.
 Benson, L., 32, 777.
 Benson, N., 343.
 Bent, A. C., 545.
 Bentley, E. W., 95.
 Bentley, F., 611.
 Bentley, J. R., 405.
 Bentley, M. R., 187.
 Bentley, R. C., 284.
 Benton, C., 694.
 Benton, M., 300.
 Bercaw, L. O., 287, 585.
 Beresford, H., 724, 725.
 Berg, A., 680.
 Berg, C. P., 698.
 Berg, L. R., 616, 697.
 Bergdoll, M. S., 466, 659.
 Berger, K., 513.
 Bergman, A. J., 103.
 Bergman, H. F., 224, 800.
 Bergmann, M., 471.
 Bergren, W. R., 778.
 Berkeley, G. H., 687, 691, 810.
 Berkley, E. E., 493, 650.
 Berkman, S., 420.
 Berlner, V., 47.
 Berliner, V. R., 208.
 Bernard, M., 631.
 Bernard, R., 85, 407.
 Bernstein, T. B., 193.
 Borretton, J. G., 706.
 Berridge, A., 804.
 Berry, J. A., 139.
 Berry, L. N., 102.
 Berryhill, I. W., 96.
 Bertagnolli, A., 546.
 Bertin, R. L., 577.
 Bertramson, B. R., 618, 641.
 Bertrand, D., 350.
 Bertrand, G., 354.
 Besley, A. K., 259.
 Besone, J., 20.
 Bessey, E. A., 244.
 Bessey, O. A., 312.
 Best, A. H., 332.
 Bethel, J., 524.
 Bethell, F. H., 454.
 Bethke, R. M., 261, 262, 560.
 Beule, J. D., 544.
 Bever, W. M., 811.
 Beveridge, W. I. B., 273.
 Beverly, V. C., 183.
 Beyer, G. F., 330.
 Bezdek, H., 719.
 Blale, J. B., 521.
 Blanchl, F. A., 547.
 Bibby, F. F., 822.
 Bice, C. M., 701.
 Biebel, J. P., 649.
 Biefeld, L. P., 173.
 Biely, J., 151, 720.
 Bierly, I. R., 130.
 Bierman, Q. H., 285.
 Blester, H. E., 714.
 Bigger, J. H., 53, 503.
 Billings, F. L., 151.
 Billings, S. C., 821.
 Billings, W. D., 205.
 Bina, A. F., 13.
 Bludloss, E. A., 494.
 Binkley, A. M., 669, 801.
 Binkley, S. B., 461.
 Binkley, W. C., 438.
 Binney, T. H., 414.
 Binnington, D. S., 154.
 Blans, W., 612, 713.
 Birch, R. R., 567.
 Bird, E. W., 263, 264.
 Bird, H. R., 263, 275, 559.
 Bird, J. J., 367, 464.
 Bird, O. D., 10, 762.
 Birkeland, C. J., 61.
 Blsby, G. R., 776.
 Bishop, G., 129.
 Bishopp, F. C., 96.
 Bissell, T. L., 64, 247.
 Bisson, C. S., 59, 339.
 Biswell, H. H., 661.
 Bitancourt, A. A., 70, 82, 889, 530.
 Bitting, M. H., 592.
 Blzell, J. A., 58.
 Bjorka, K., 732.
 Blacet, F. E., 5.
 Black, J. D., 582, 583.
 Black, L. M., 658.
 Black, R. H., 864.
 Black, S., 310.
 Black, W. E., 129.
 Black, W. H., 98, 258.
 Blackmon, G. H., 225, 799.
 Blackstone, J. H., 754.
 Blackwell, D. W., 36.
 Brael, W. J., 5.
 Blair, I. D., 381.
 Blair, J. C., 516.
 Blake, E., 591.
 Blakeslee, A. F., 31, 38, 781.
 Blakeslee, L. H., 208, 657.
 Blanch, G. T., 733.
 Blanchard, K. L., 197.
 Blandau, R. J., 499, 654.
 Blanding, S. G., 324.
 Blandy, D. E., 279.
 Blanford, C. J., 129.
 Blank, L. M., 234.
 Blanks, R. F., 121, 128.
 Blanton, F. S., 256, 830.
 Blasdale, W. C., 818.
 Blaser, R. E., 257, 768, 791, 833.
 Blattner, R. J., 567.
 Blauser, I. P., 126.
 Bledsoe, R. F., 216.
 Blish, M. J., 16, 472.
 Bliss, D. E., 522, 523.
 Blivalas, B., 655.
 Blodgett, E. C., 679.
 Blodgett, F. M., 67.

- Blood, H. L., 239.
 Blum, H. F., 598.
 Blume, J. M., 774.
 Blumenthal, H. T., 503.
 Blumstein, A., 274.
 Blunn, C. T., 208.
 Blyth, J. S. S., 49.
 Bobb, M. L., 824.
 Bodily, H. L., 467.
 Bodine, E. W., 81, 240, 691.
 Boelter, L. M. K., 445.
 Boerner, E. G., 214.
 Boewe, G. H., 377, 680.
 Bogart, R., 47, 200, 361.
 Boggess, T. S., Jr., 836.
 Boggs, M. M., 139, 404, 447.
 Bohlender, G. P., 156.
 Bohn, G. W., 67.
 Bohstedt, G., 98, 259, 554, 705.
 Boicourt, A. W., 64.
 Bolas, B. D., 515.
 Boley, L. E., 274, 504, 853.
 Bolln, D. W., 616, 697, 739.
 Bolin, O., 53, 503.
 Boling, J. L., 501.
 Bollins, G. P., 130.
 Bolton, W., 702.
 Bond, G., 37.
 Bond, H. R., 330.
 Bonde, R., 213, 228, 812.
 Bondurant, J. H., 130, 438.
 Bondy, F. F., 393.
 Bongini, V., 535.
 Bonner, D., 32.
 Bonner, J., 32, 351, 353, 488.
 Bonnet, J. A., 184, 213, 229.
 Bonnett, O. T., 503, 545.
 Bonney, V. B., 330.
 Bonser, H. J., 444.
 Booher, L. E., 6, 801.
 Bookhout, B. R., 730.
 Boonstra, C. A., 809.
 Booth, M., 733, 866.
 Borasky, R., 654.
 Borda, E., 799.
 Borden, R. J., 218.
 Borg, W. T., 285.
 Borland, A. A., 562, 842.
 Borman, E. K., 107.
 Bornstein, S., 712.
 Bortfeld, C. F., 635.
 Borthwick, H. A., 40, 357.
 Borton, H., 607.
 Borzacov, V., 631.
 Boswell, V. R., 58.
 Bot, G. M., 493.
 Botkin, C. W., 635.
 Botts, R. R., 583.
 Bottum, J. C., 582, 729.
 Botwright, W. E., 192.
 Boucher, R. V., 554, 558, 838.
 Boudreau, F. G., 743.
 Boughton, D. C., 272.
 Boughton, I. B., 854.
 Bourne, A. I., 547, 820, 824.
 Boutwell, R. K., 137.
 Büvling, A. G., 831.
 Bowen, A. B., 367.
 Bowes, A. deP., 446.
 Bowle, A., 897.
 Bowling, G. A., 264.
 Bowlaby, C. C., 23.
 Bowman, J. J., 386.
 Bowser, P., 803.
 Bowstead, J. E., 716.
 Boxell, K. C., 704.
 Boyce, A. M., 396, 403.
 Boyce, E. F., 834.
 Boyd, A. E. W., 535.
 Boyd, F. T., 768, 791, 833.
 Boyd, H. M., 621, 750.
 Boyd, I. L., 191.
 Boyd, O. C., 631, 680, 800, 805.
 Boyer, P. D., 410, 705.
 Boyland, P. M., 753.
 Boyle, H. H., 888.
 Boyle, P. E., 598.
 Boynton, D., 61, 671.
 Boynton, W. H., 424.
 Bozovaitsky, L. S., 537, 649.
 Bracken, A. F., 612.
 Brackett, E. E., 302.
 Brackett, S., 80.
 Bradbury, J. T., 362, 671.
 Bradbury, N. E., 181.
 Bradfield, R., 23, 53, 616.
 Bradley, M. V., 786.
 Bradley, W. H., 468.
 Bradley, W. G., 89, 254.
 Bradshaw, H. C., 867.
 Brady, D. E., 98, 697, 725, 739.
 Brady, D. S., 158, 159, 321, 608, 897.
 Bragdon, K. P., 768.
 Brain, E. D., 351.
 Bramble, W. C., 524, 546.
 Branamaun, G. A., 258, 496, 554.
 Brandly, C. A., 118, 564.
 Brandon, J. F., 219, 511.
 Brandt, A. E., 428.
 Brandt, K., 582.
 Brannon, J. M., 562.
 Brasher, E. P., 220, 222.
 Bratley, C. O., 518.
 Bratley, H. E., 806, 822.
 Bratton, C. A., 130.
 Bratton, R. W., 103.
 Braude, R., 406.
 Braun, A. C., 70.
 Bray, R. H., 29.
 Bray, R. W., 98.
 Breakey, E. P., 247, 393.
 Bream, R. O., 523.
 Breed, R. S., 842.
 Breese, A., 181.
 Bregger, T., 701.
 Breiter, H., 889.
 Breland, O. P., 255.
 Breneman, W. R., 365, 502.
 Brentzel, W. E., 75, 195, 686.
 Breslove, B. B., 109.
 Bressler, R. G., Jr., 872, 873.
 Bressman, E. N., 758.
 Brett, C. C., 231.
 Brewer, J. H., 485.
 Bridges, J. O., 507.
 Brier, G. W., 556.
 Brierley, P., 64.
 Briggs, A. P., 150.
 Briggs, D. R., 327, 328.
 Briggs, F. N., 511.
 Briggs, G. M., 409.
 Briggs, G. M., Jr., 839.
 Briggs, H. M., 97, 101, 700.
 Brigham, R., 136.
 Brightwell, W. T., 371.
 Brill, G. D., 638.
 Brindley, T. A., 694.
 Brinegar, T. E., 506.
 Brink, R. A., 46, 206.
 Brinkerhoff, L. A., 67.
 Brison, F. R., 240, 804.
 Britten, R. H., 609.
 Brittingham, W. H., 206.
 Britton, J. W., 109, 852.
 Broadfoot, H. H., 752.
 Broadfoot, W. M., 333.
 Brod, H. W., 631.
 Brode, W. R., 193.
 Brodell, A. P., 292, 297.
 Brodie, H. J., 70.
 Brody, H. W., 694.
 Brody, S., 98, 103, 265.
 Brokaw, W. C., 52.
 Bromberg, Y. M., 710.
 Bromley, S. W., 830.
 Bronk, D., 609.
 Brooks, A. N., 806.
 Brooks, C., 542.
 Brooks, L. E., 372.
 Brooks, R. M., 519.
 Brooks, S. C., 202.
 Brooks, T. E., 485.
 Brophy, J., 260.
 Browder, J., 610.
 Browder, S., 655.
 Brown, A. A., 733, 866.
 Brown, A. M., 684.
 Brown, A. W. A., 400.
 Brown, B. E., 213.
 Brown, C. A., 32.
 Brown, D. S., 80.
 Brown, E. B., 13.
 Brown, E. J., 895.
 Brown, E. M., 52.
 Brown, E. O., 55, 512.
 Brown, F. M., 392.
 Brown, G. B., 166, 625.
 Brown, H. D., 59, 801.
 Brown, H. E., 85, 111, 696, 821.
 Brown, H. M., 217.
 Brown, J. C., 739.
 Brown, J. E., 609.
 Brown, J. G., 243.
 Brown, J. H., 38, 34.
 Brown, M. S., 206, 863.

- Brown, P. C., 466.
 Brown, R., 729.
 Brown, R. A., 10.
 Brown, R. L., 372.
 Brown W. H., 415, 704.
 Brown, W. S., 468.
 Browne, C. A., 616.
 Browne, F. L., 128.
 Browne, J. S. L., 789.
 Browning, G. M., 27, 333, 484, 660.
 Broyer, T. C., 331, 645, 783.
 Bruchsalter, F. S., 155.
 Bruckner, J. H., 47, 324.
 Brueckner, H. J., 104.
 Brumfield, R. T., 31, 785.
 Brundage, R. C., 676.
 Bruner, D. W., 419, 712, 857.
 Brunson, A. M., 616, 659.
 Brunstetter, B. C., 33.
 Bryan, A. H., 119, 271.
 Bryan, C. S., 268, 420, 715, 847, 848, 853.
 Bryant, L. R., 519.
 Bryant, R. L., 127.
 Buchanan, L. L., 253.
 Buchanan, M. T., 435.
 Buchanan, R. E., 212, 322.
 Buchanan, W. D., 92, 833.
 Buchholtz, W. F., 504, 513, 528, 681.
 Buchholz, A. B., 831.
 Buckell, E. R., 90.
 Buckner, G. D., 558.
 Bueding, E., 603.
 Huehrer, T. F., 771.
 Buhs, R. P., 626.
 Bukasov, S. M., 487.
 Bull, H. B., 471.
 Bull, S., 496, 554, 588, 700.
 Bullard, J. F., 655, 709.
 Buller, A. H. R., 495.
 Bullis, K. L., 721, 858.
 Bullock, J. F., 367.
 Bullock, R. M., 62, 372.
 Bullough, W. S., 790.
 Bunce, A. C., 283, 582.
 Bunyen, H., 724.
 Bunzell, H. H., 146, 479.
 Burcalow, F. V., 483, 574.
 Burdette, W. J., 363.
 Burdick, H. O., 501.
 Burgess, I. M., 220.
 Burgin, C. J., 899.
 Burgwald, L. H., 707.
 Burke, E. M., 260.
 Burke, V., 34.
 Burkhart, E. Z., 211.
 Burkhart, L., 477.
 Burkholder, C. L., 668, 679, 725.
 Burkholder, P. R., 32, 38, 83.
 Burkholder, W. H., 67, 68, 383, 809.
 Burkitt, W. H., 404, 835.
 Burlison, W. L., 52, 55, 308, 503, 573.
 Burmester, B. R., 496.
 Burn, C. G., 599, 600.
 Burnett, J. R., 48.
 Burnett, L. C., 212, 214.
 Burnett, R. S., 178.
 Burnham, J. C., 251.
 Burns, G. R., 649.
 Burr, B. G., 277.
 Burr, C. G., 302, 737.
 Burr, G. O., 167.
 Burrell, A. B., 67.
 Burrell, R. C., 783.
 Burrill, M. W., 499, 789.
 Burris, R. H., 33, 777.
 Burroughs, W., 554.
 Burrows, W., 418.
 Burström, H., 354.
 Burton, G. W., 535, 787.
 Buse, L. A., 866.
 Bush, V., 609.
 Bushnell, J., 519.
 Bushnell, T. M., 729.
 Businsky, F. C., 246.
 Bussell, F. P., 53.
 Buswell, A. M., 573.
 Butcher, E. O., 654.
 Butkevich, W. S., 777, 784.
 Butler, A. M., 317.
 Butler, C. G., 96, 553, 833.
 Butler, R. E., 480.
 Butler, R. L., Jr., 392.
 Butt, H. R., 461.
 Butz, E. L., 730.
 Byerly, T. C., 561, 658.
 Byers, G. B., 130.
 Byers, H. G., 190.
 Byram, G. M., 679.
 Cahill, W. H., 149.
 Cain, C. K., 789.
 Cain, J. C., 61, 760.
 Caine, A. B., 256.
 Cairns, D., 369.
 Čajlachjan, M. C., 783.
 Cake, E. W., 129.
 Calderwood, H. N., 336.
 Caldwell, A. C., 184, 611.
 Caldwell, L. M., 507.
 Caldwell, R. M., 659.
 Caldwell, W. E., 347.
 Callan, E. M., 552.
 Callenbach, E. W., 102, 434, 837.
 Callenbach, J. A., 505, 546.
 Calvin, M., 474.
 Calvino, E. M., 243.
 Camburn, O. M., 563.
 Cameron, A. T., 52.
 Cameron, H. S., 209, 423, 656.
 Cameron, S. H., 521.
 Camillo, L. J., 19.
 Camp, A. F., 224, 799.
 Camp, J. P., 791, 806.
 Camp, W. H., 82.
 Campan, E. J., 546.
 Campbell, E. P., 710.
 Campbell, H. G., 154.
 Campbell, I. L., 844.
 Campbell, J. A., 59, 257.
 Campbell, J. C., 531.
 Campbell, L., 372, 378.
 Campbell, M. H., 612.
 Campbell, R. E., 252.
 Campbell, W. A., 83, 389, 390.
 Campbell, W. G., 400.
 Campos, A. R., 535.
 Candido M. Carvalho, J., 403, 566.
 Canning, J. B., 583.
 Cannon, C. Y., 209, 212, 263, 267.
 Cannon, H. G., 627.
 Cannon, J. H., 330.
 Carbone, M. S., 628.
 Card, L. E., 496, 584, 869.
 Cardon, B. P., 771.
 Cardwell, A. B., 513.
 Carle, B. N., 717.
 Carleton, E. A., 374.
 Carlson, E. C., 393.
 Carlson, F. W., 395.
 Carlson, G. B., 850.
 Carlson, L., 169.
 Carlson, P. J., 697.
 Carlson, W. E., 484, 571.
 Carman, G. E., 90.
 Carmel, Y. A., 158.
 Carmichael, J., 52, 114, 118.
 Carnes, A., 430.
 Carns, W. A., 367.
 Carol, J., 330.
 Carolus, R. L., 668.
 Carpolan, L. H., 95.
 Carpenter, D. C., 166.
 Carpenter, G. A., 130, 732.
 Carpenter, J., 505.
 Carrero, J. O., 617.
 Carrick, C. W., 655, 697, 725.
 Carrick, R., 820.
 Carrigan, R. A., 760, 806.
 Carroll, F., 259.
 Carroll, P. T., 71.
 Carroll, W. E., 554, 788.
 Carroll, W. R., 749.
 Carruth, L. A., 829.
 Carson, S. F., 202.
 Carter, A. S., 344.
 Carter, D. G., 128, 282.
 Carter, H. E., 454.
 Carter, R. H., 304, 531.
 Carter, W., 229, 251, 651.
 Carter, W. B., 548.
 Cartter, J. L., 510.
 Cartwright, O. L., 393.
 Cartwright, W. B., 694.
 Carvalho, J. C. M., 403, 566.
 Carver, G. W., 589.
 Carver, J. S., 103, 278, 282, 404, 562, 841, 882.
 Carver, W. A., 791.

- Cary, C. A., 105.
 Casals, J., 858.
 Casanges, A. H., 825.
 Case, H. C. M., 583, 608.
 Cash, E. K., 381.
 Cash, J. G., 265, 584.
 Casida, L. E., 209.
 Casis, S. G., 255.
 Caskey, C. D., 99.
 Casselberry, N. H., 424.
 Cassell, R. C., 52.
 Cassidy, W. E., 760.
 Cassil, C. C., 331.
 Castell, C. H., 106, 680.
 Castellanos, A., 104.
 Caster, A. B., 610.
 Castle, W. E., 496, 789.
 Cathcart, R. B., 900.
 Cathcart, W. H., 447, 450, 590, 603.
 Catherwood, M. P., 130.
 Catton, D., 691, 815, 816.
 Cattell, J., 454.
 Caulfield, W. J., 269.
 Cave, M. S., 405.
 Cerecedo, L. R., 456.
 Chace, E. M., 447.
 Chadderdon, H., 302.
 Chadwick, L. C., 221.
 Chaffee, E., 33.
 Chamberlain, G. C., 241.
 Chamberlin, F. S., 391.
 Chamberlin, V. D., 260, 559, 581.
 Chambers, E., 589.
 Chan, S. Y., 528.
 Chance, F. S., 367, 404.
 Chandler, A. C., 419.
 Chandler, F. B., 197, 220.
 Chandler, J. P., 745.
 Chandler, R. C., 165, 474.
 Chandler, R. F., Jr., 23, 65.
 Chandler, S. C., 247, 545.
 Chaney, R. W., 485.
 Chanturia, N. N., 520.
 Chapin, F. S., 609.
 Chapin, W. E., 372.
 Chapline, W. R., 98.
 Chapman, A. B., 209.
 Chapman, A. G., 524.
 Chapman, G. L., 524.
 Chapman, H. D., 643, 770.
 Chapman, P. J., 323, 402, 827.
 Charles, V. K., 349, 487, 543.
 Chase, L. W., 123.
 Chatterjee, P. N., 395.
 Chatterjee, S. N., 395.
 Chandle, V. I., 31, 651.
 Cheldelin, V. H., 170, 622.
 Chen, H. K., 36, 350.
 Chen, J., 452.
 Chen, K. K., 502.
 Chen, S. C., 595.
 Cheng, T. Y., 154.
 Chepil, W. S., 26.
 Cherian, M. C., 401.
 Cherrington, V. A., 703, 709.
 Chester, K. S., 66, 248, 527.
 Chestnut, A. F., 67.
 Childers, N. F., 61, 694.
 Childs, L., 824.
 Chilson, W. H., 104.
 Chilton, S. J. P., 682, 810.
 Chin, T.-C., 31.
 Chisman, H. H., 804.
 Chitre, R. G., 589.
 Chitty, D., 246.
 Chitty, H., 246.
 Chitwood, B. G., 67, 78, 389.
 Chiu, S. F., 248.
 Chopra, R. N., 86.
 Chouke, K. S., 503.
 Christ, J. W., 220.
 Christensen, B. E., 170, 177.
 Christensen, C., 776.
 Christensen, C. M., 693, 819.
 Christensen, F. W., 836.
 Christensen, H. N., 852.
 Christensen, H. T., 736.
 Christensen, J. F., 422.
 Christensen, N. O., 718.
 Christenson, R. O., 392.
 Christie, R., 112.
 Christopher, E. P., 517, 521.
 Christy, D. F., 285.
 Chu, H. I., 154.
 Chuka, J. A., 213, 228, 685.
 Chui, Y. S., 248.
 Chupp, C., 57, 67.
 Church, C. F., 446.
 Church, C. G., 447.
 Churchill, B. R., 795.
 Churchill, E. S., 102, 882.
 Cieslak, E. S., 358.
 Ciocco, A., 311.
 Circle, S. J., 618.
 Clriacy-Wantrup, S. v., 582, 583.
 Cladakis, N. J., 583.
 Clagett, C. O., 605.
 Clapham, P. A., 392.
 Clapp, A. L., 663.
 Clapp, R., 225.
 Clapp, R. T., 677.
 Clark, C. F., 228.
 Clark, C. K., 760.
 Clark, D. G., 32, 194.
 Clark, E. P., 171.
 Clark, E. R., 512.
 Clark, F., 136, 791.
 Clark, F. E., 688.
 Clark, F. J., 206.
 Clark, G. R., 331.
 Clark, H. E., 779.
 Clark, H. W., 206.
 Clark, J., 97.
 Clark, J. A., 511, 667, 797.
 Clark, J. H., 63, 376, 476, 520.
 Clark, N., 609.
 Clark, R. T., 860, 555, 556.
 Clark, T. B., 837.
 Clark, T. F., 169.
 Clark, V. I., 258.
 Clarke, A. E., 45.
 Clarke, E., 655.
 Clarke, M. K., 858.
 Clarke, W. S., Jr., 518.
 Clausen, C. P., 89.
 Clausen, J., 485.
 Clavell, C. J., 213, 221.
 Clawson, M., 130, 131, 436.
 Clay, H. P., 579.
 Claypool, L. L., 60.
 Clayton, B. S., 429, 768.
 Clayton, C. B., 323.
 Clayton, C. N., 378, 528.
 Clayton, E. E., 76.
 Clayton, H. H., 340.
 Clayton, M. M., 302.
 Cleaver, T., 573.
 Clegg, R. E., 895.
 Clements, E. S., 485.
 Clements, F. E., 485.
 Clements, H. F., 218, 490.
 Clendenning, K. A., 493.
 Clifford, P. A., 330.
 Clinch, P. E. M., 539.
 Cline, A. C., 540.
 Clise, L., 99.
 Clore, W. J., 367, 372, 451.
 Close, C. P., 801.
 Clyde, A. W., 573.
 Clyde, G. D., 727.
 Coates, W. H., 344.
 Cobb, S., 553.
 Coblentz, W. W., 181.
 Coburn, D. R., 118.
 Cochran, F. D., 611.
 Cochran, H. L., 60, 64.
 Cochran, R. G., 512.
 Cochran, W. G., 212.
 Cockbill, G. F., 833.
 Cockerell, T. D. A., 89.
 Cockrum, E. E., 503.
 Coe, F. M., 223.
 Coe, R. C., 50.
 Coffin, M. H., 897.
 Coffman, F. A., 684.
 Cohen, B., 34.
 Cohen, M., 253.
 Cohen, S. S., 77.
 Cohn, E. J., 141.
 Cohn, M., 745.
 Coile, T. S., 804.
 Colby, A. S., 516, 545.
 Colby, R. W., 468.
 Colby, W. G., 370, 792.
 Cole, A. C., 545.
 Cole, C. H., 97.
 Cole, H. H., 413.
 Cole, L. J., 49.
 Cole, R. K., 47, 498.
 Coleman, O. H., 219, 511.
 Coleman, O. T., 169.
 Coleman, R., 52, 344, 632, 660.
 Coles, J. V., 158, 754.
 Colhoun, J., 74.
 Colichman, E. L., 763.

- Collier, G. W., 582.
 Collins, A. F., 729.
 Collins, D. L., 90.
 Collins, E., 866.
 Collins, E. K., 510.
 Collins, E. V., 123, 214, 247,
 277, 284, 862, 883.
 Collins, M. A., 104.
 Collison, R. C., 223, 224, 374,
 802.
 Colón Torres, R., 25, 284.
 Colvard, D. W., 47.
 Comar, C. L., 181, 333, 616,
 619, 659.
 Combs, G. F., 99, 560.
 Combs, O. B., 513.
 Comfort, J. E., 98, 834.
 Comin, D., 515.
 Common, R. H., 408, 409, 702.
 Compton, C. C., 545.
 Compton, K. T., 609.
 Compton, L. E., 659.
 Compton, O. C., 27, 61.
 Comstock, R. E., 210, 406.
 Condit, I. J., 35.
 Conklin, M. E., 781.
 Couley, C. L., 412.
 Conn, H., 312.
 Conn, H. J., 34, 205.
 Conn, J. B., 852.
 Conn, J. E., 34, 773.
 Connally, H., 790.
 Connell, W. A., 245.
 Conner, R. T., 9, 10, 148, 450,
 452, 453.
 Conners, I. L., 807.
 Connola, D., 90.
 Connor, M. L., 286, 287.
 Conquest, V., 98.
 Conrad, J. P., 774.
 Conrat, H. L. F., 207, 361,
 362, 501, 503.
 Consolazio, W. V., 172.
 Constance, L., 495.
 Cook, D. H., 165, 213, 229.
 Cook, E. S., 778.
 Cook, F. W., 721.
 Cook, G. M., 850.
 Cook, H. C., 445.
 Cook, H. L., 659.
 Cook, H. T., 67, 528, 685.
 Cook, M. T., 376.
 Cook, R. P., 154.
 Cook, W. C., 394.
 Cooke, W. B., 680.
 Cooley, R. B., 97.
 Coolidge, H. J., Jr., 755.
 Coombes, A. I., 702.
 Cooper, D. C., 46, 206.
 Cooper, G. O., 785.
 Cooper, H. P., 366, 465.
 Cooper, J. F., 395.
 Cooper, L. F., 306.
 Cooper, M. L., 596.
 Cocper, M. R., 292.
 Cooper, T. P., 899.
 Cooper, W. S., 36.
 Copley, T. L., 343.
 Copp, D. H., 747.
 Copper, R. R., 53.
 Corbett, A. C., 715.
 Corbett, R. B., 123.
 Corbett, W. J., 108.
 Cordner, H. B., 222, 373, 665,
 668.
 Cordy, C. B., 377, 824.
 Cordy, D. R., 425.
 Cori, C. F., 454.
 Corkle, M. A., 191, 228.
 Cornell, F. D., Jr., 731.
 Cornman, J. F., 53.
 Correa, A. B., 67.
 Correll, J. T., 560.
 Corson, J. J., 582.
 Corum, C. J., 196.
 Cory, E. N., 393, 830, 831.
 Costa, A. S., 78, 235.
 Costa Rosa, J., 81.
 Costello, D. F., 258.
 Costigan, S. M., 192.
 Coto Fernández, R., 458.
 Cottam, H. R., 586.
 Cotton, R. T., 395.
 Cotton, W. P., 873.
 Couper, H. V., 400.
 Cover, S., 98, 809.
 Cowan, E. W., 775.
 Cowart, F. F., 375, 760, 799.
 Cowden, J. M., 283.
 Cowden, T. K., 729, 730.
 Cowgill, G. R., 147.
 Cowsert, W. C., 412.
 Cox, B. F., 711.
 Cox, C. E., 239.
 Cox, G., 452.
 Cox, G. A., 844.
 Cox, G. M., 212.
 Cox, H. R., 483, 639.
 Cox, L. G., 65.
 Cox, M. J., 885.
 Cox, S., 66.
 Coyner, W. R., 248.
 Crabtree, D. G., 541.
 Craft, W. A., 209.
 Crafts, E. C., 506.
 Cragg, J. M., 851.
 Craig, W. T., 53.
 Craigle, J. H., 68.
 Cralley, E. M., 377.
 Crampton, B. W., 97, 258,
 701.
 Crane, J. C., 704.
 Crane, M. M., 316.
 Cravens, W. W., 555, 840.
 Crawford, C. L., 522.
 Crawford, D. L., 610.
 Crawford, L. A., 732.
 Crawford, R. F., 248.
 Cray, R. E., 586.
 Creager, D. B., 244, 680.
 Creech, G. T., 718.
 Creek, C. R., 866.
 Creighton, J. T., 851.
 Cress, M., 677.
 Crevasse, J. M., Jr., 372.
 Crickman, C. W., 582, 731.
 Crisler, O. S., 108.
 Crist, J. C., 19.
 Crist, J. W., 140.
 Crockett, S. P., 699.
 Croll, R. D., 233.
 Cromer, C. O., 504.
 Cromer, G. W., 770.
 Cronin, A. G., 778.
 Cronister, K., 158, 321.
 Cropsey, M. G., 864.
 Crosler, W., 222, 323, 512.
 Cross, C. E., 792.
 Cross, C. R., 672.
 Cross, F., 116, 851.
 Cross, F. B., 673, 674.
 Cross, G. L., 31, 205.
 Cross, J. C., 397.
 Crow, J. F., 363.
 Crowell, R. L., 696.
 Crowley, D. J., 367, 372, 378.
 Crown, R. M., 98, 833.
 Crowsen, M. E., 214.
 Cruess, W. V., 17, 20, 139,
 330, 590, 610, 752.
 Crumbaker, D. E., 467.
 Crupper, J. C., Jr., 900.
 Cruz, S. R., 120, 127, 431.
 Cruz Monclova, H. E., 213.
 Csonka, F. A., 138, 698.
 Cudd, H. H., 171.
 Cudney, R. E., 467.
 Culbert, J. R., 803.
 Culbertson, C. C., 97, 209, 212,
 256, 283, 303.
 Culbertson, J. T., 712.
 Cullinan, B., 512.
 Cullinan, F. P., 62.
 Cullison, A. E., 405, 700, 835.
 Culp, R., 45.
 Cumley, R. W., 49, 363.
 Cummings, J. N., 209, 555.
 Cummings, R. W., 23.
 Cummings, W. H., 526, 677.
 Cummins, G. B., 679.
 Cunningham, H. S., 815.
 Cunningham, J. B., 583.
 Cunningham, L. C., 130.
 Curl, A. L., 617.
 Curran, H. R., 33, 192.
 Currence, T. M., 515.
 Currey, E. A., 304, 669, 741.
 Curtis, A. H., 64.
 Curtis, D. S., 770.
 Curtis, H. A., 616.
 Curtis, J. J., 219, 511.
 Curtis, M. R., 260, 361.
 Curtis, O. F., 32, 530.
 Curtis, O. F., Jr., 337.
 Curtis, W. E., 90, 821.
 Curtiss, C. F., 284.
 Curtiss, W. M., 130.
 Cushman, M., 817.

- Cutler, G. H., 659.
 Cutler, H. C., 494.
 Cutler, H. H., 733.
 Cutuly, E., 655.

 Dahlberg, A. C., 270, 845.
 Dable, C. D., 563.
 Dahms, R. G., 548.
 Daigh, F. C., 245.
 Dalley, D. L., 209, 657.
 Daines, R. H., 377, 531, 541, 686, 813.
 Dalby, G., 532.
 Damon, S. R., 274, 719.
 Danchakoff, V., 655.
 Daniel, F. B., 877.
 Daniel, H. A., 638.
 Daniel, T. W., 404.
 Daniels, A. L., 595, 596.
 Dann, F. P., 150.
 Dann, W. J., 14.
 Darby, C. W., 715.
 Dark, S., 589.
 Darling, H. M., 505.
 Darlow, A. E., 700.
 Darrow, G. M., 224, 241, 519, 520.
 Daubenmire, R. F., 36.
 Daubney, R., 109, 113, 209.
 Daugherty, M. M., 283.
 Daunoy, H. L., 243.
 Davidson, 284.
 Davidson, J. A., 262.
 Davidson, J. B., 133, 183, 214, 277, 802, 803.
 Davidson, O. W., 483, 669, 818.
 Davidson, R. W., 83, 389, 390.
 Davidson, W. M., 257.
 Davies, A. W., 891.
 Davies, G. N., 37.
 Davies, W. L., 415.
 Davis, A. C., 391.
 Davis, B. H., 817.
 Davis, B. L., 473.
 Davis, C. C., 285.
 Davis, C. H., 782.
 Davis, D. E., 500, 655, 657.
 Davis, E. M., 577.
 Davis, F. E., 340.
 Davis, G. E., 53.
 Davis, G. K., 97, 258.
 Davis, H. A., 347.
 Davis, H. N., 609.
 Davis, H. P., 209, 657.
 Davis, J. G., 106.
 Davis, J. J., 807.
 Davis, J. K., 165.
 Davis, J. S., 734.
 Davis, K. C., 435, 866.
 Davis, L. D., 519, 656.
 Davis, L. L., 513.
 Davis, M. E., 447.
 Davis, S. G., 760.
 Davis, S. H., Jr., 83.
 Davis, W. B., 331, 490.

 Davis, W. H., 680.
 Davison, R. L., 609.
 Davison, V. E., 545.
 Davy, R. H., 377.
 Daw, E. B., 453.
 Dawson, M. H., 33.
 Dawson, R. F., 201.
 Day, A. A., 141.
 Day, D., 39.
 Day, F. T., 500.
 Day, H. G., 149, 315, 507.
 Day, M. W., 226, 245.
 Deal, E. C., 330.
 Deal, J., 90.
 Dean, H. K., 860.
 Dean, R. W., 256, 899.
 Deanesly, R., 52.
 Deans, P. D., 176.
 Dearborn, C. H., 537.
 Deardorff, M. F., 596.
 De Bach, P., 821.
 Decker, G. C., 247, 248, 820.
 Decker, P., 67.
 Deen, E., 370.
 Deere, R., 610.
 DeFelice, D., 455.
 de Fluiter, H. J., 817.
 DeFrance, J. A., 214.
 de Gara, P. F., 715.
 Degiusti, D. L., 119.
 Degman, E. S., 374.
 DeGraff, H. F., 129.
 Deliss, J., 578.
 de Jesús, F., 284.
 de Jongh, P., 350.
 Delbrück, M., 192.
 Deloz, A. L., 697, 709.
 DeLong, H. H., 573, 578.
 del Toro, E., Jr., 284.
 Delwiche, C. C., 645.
 Delwiche, E. J., 483, 505, 513, 801.
 Demarest, B., 6.
 Dengler, E. R., 381.
 Denniston, I. W., 709.
 Denny, F. E., 589, 645.
 DenUyl, D., 677.
 Deonier, C. C., 255.
 DePuy, G. S., 158.
 Derrick, E. H., 111.
 Desai, M. H., 395.
 Descartes, S. L., 284, 293, 876.
 de Soriano, A. M., 485.
 deSouza, O. F., 235.
 Deszyck, E. J., 330, 331, 643.
 Detjen, L. R., 220.
 DeTurk, E. F., 174, 482, 503, 640.
 Deuel, H. J., Jr., 309, 844.
 DeVault, S. H., 132, 134, 878.
 Devereux, E. D., 268.
 de Waal, H. L., 851.
 de Wet, W. J., 397.
 Dewey, J. E., 827.
 Dexter, S. T., 194.

 Diachun, S., 229, 383.
 Díaz Pacheco, S., 284, 870, 871.
 Di Cl6, A. V., 362.
 Dick, R. D., 551.
 Dickerson, G. E., 209.
 Dickey, R. D., 799.
 Dickins, D., 321, 609, 889.
 Dickinson, E. M., 859.
 Dickman, S. R., 29.
 Didlake, M., 370.
 Diehl, H. C., 139.
 Dietz, C. F., 616, 659.
 Dikmans, G., 112.
 Dill, D. B., 172.
 Dillman, A. C., 369.
 Dillon, E. S., 549.
 Dillon, L. S., 549.
 Dillon Weston, W. A. R., 231.
 Dilworth, R. I., 270.
 Dimick, K. P., 177.
 Dimock, A. W., 67, 82.
 Dimock, W. W., 274, 857.
 Dimond, A. E., 67, 230, 900.
 Dimsmore, W., 97.
 Dittman, L. P., 393, 821.
 Dizikes, J. L., 268.
 Doan, F. J., 268, 563.
 Dobbs, C. G., 776.
 Dobzhansky, T., 43.
 Dodd, D. R., 661.
 Dodge, A. F., 525.
 Dodge, B. O., 494.
 Dodge, C. W., 533.
 Dodson, W. R., 633.
 Doehlert, C. A., 520.
 Dobanian, S. M., 401.
 Dolsy, E. A., 461, 789.
 Dolecek, R. L., 554.
 Dolezal, E., 801.
 Dolger, H., 315, 894.
 Doll, R. J., 900.
 Dominick, C. B., 549, 831.
 Donum, L. V., 500, 655.
 Donald, H. P., 210.
 Donaldson, R. W., 769, 792.
 Donelson, E., 592.
 Donen, I., 816.
 Doneth, J. C., 322, 435.
 Donham, C. R., 709.
 Donnelly, J., 31, 647.
 Donnelly, M., 674.
 Donohue, R. O., 319.
 Doob, H., Jr., 175.
 Doollittle, S. P., 238, 373, 538.
 Doran, C. W., 855.
 Doran, W. L., 376, 806.
 Dorfman, A., 109.
 Dorman, C., 159.
 Dorn, F. L., 270.
 Dörner, H. B., 523.
 Dörner, W., 413.
 Dorsey, M. J., 504, 516.
 Dosch, E. F., 764.
 Doss, M. A., 850.
 Dotsen, S. B., 227, 236, 899.

- Doty, D. M., 344, 616, 659.
 Doucette, B. F., 22.
 Dougherty, R. W., 853.
 Douglas, J. R., 90.
 Douglas, W. A., 91, 232.
 Douglass, E., 834.
 Dove, W. F., 183, 280, 303.
 Dowding, E. S., 493.
 Dowell, A. A., 732.
 Downing, C. G. E., 123.
 Downing, J. C., 132.
 Downs, D. E., 603.
 Downs, P. A., 268, 850.
 Doyle, L. P., 97, 557, 697, 709.
 Dozier, E., Jr., 610.
 Drain, B. D., 367, 371, 373.
 Drake, C. J., 228, 247, 248.
 Drake, K., 344.
 Drake, M., 659.
 Drake, T. G. H., 312.
 Drechsler, C., 68, 530.
 Drew, R. J., 103.
 Drew, W. B., 794.
 Driggers, J. C., 833.
 Drama, L. O., 847.
 Drury, H. F., 629.
 Dry, F. W., 496.
 DuBois, C. W., 899.
 Du Bois, E. F., 307.
 DuBuy, H. G., 237.
 Duckworth, J., 453.
 Dudley, F. J., 102, 559.
 Duffee, F. W., 554.
 Dufrenoy, J., 32, 75, 809.
 Dugand, A., 487.
 Dukes, H. H., 49.
 Duley, F. L., 122.
 Dumbleton, L. J., 399, 551.
 Dummeier, E. F., 435.
 Dunbar, C. O., 513.
 Duncan, C. W., 412.
 Duncan, H. R., 609.
 Duncan, O. D., 587.
 Dunegan, J. C., 66.
 Dungan, G. H., 52, 53, 55, 368, 503, 573.
 Dunkelberg, G. H., 125, 366, 428.
 Dunkle, E. C., 513.
 Dunklee, D. E., 660.
 Dunlap, A. A., 74, 245.
 Dunlap, G. L., 564.
 Dunlavy, H. E., 369.
 Dunn, L. C., 361.
 Dunn, L. E., 343.
 Dunn, M. S., 4.
 Dunning, W. F., 361.
 Durant, A. J., 108.
 Dury, A., 362.
 Dutcher, R. A., 589.
 dŕ Toit, R., 272, 851.
 du Vigneaud, V., 106, 454, 624, 625.
 Duyvendijk, J. A. van, 402.
 Dye, W. S., Jr., 655.
 Dyer, A. J., 209.
 Dyer, W. J., 174, 188.
 Dykstra, T. P., 527.
 Dziedzic, L. F., 47.
 Eakin, R. E., 619.
 Eames, B., 775.
 Earle, W. C., 255.
 Easley, G. T., 209, 500.
 Eastham, J. W., 528.
 Eastwood, T. M., 649.
 Eaton, C. B., 253.
 Eaton, F. M., 199.
 Eaton, T. H., Jr., 633.
 Ebbs, J. C., 468.
 Ebbs, J. H., 593.
 Ebeling, W., 224, 547, 549.
 Eck, J. C., 165.
 Eckert, J. E., 553.
 Eckhardt, R. B., 137.
 Eckhardt, R. C., 214, 228.
 Eckhardt, R. E., 151.
 Eddins, A. H., 791, 806.
 Eddy, C. W., 327.
 Edelblute N., 452.
 Eden, A., 361.
 Edgar, R., 157, 319.
 Edgecombe, S. W., 373.
 Edgerton, C. W., 75.
 Edgerton, L. J., 61.
 Edgington, G., 190.
 Edmond, J. B., 366, 371.
 Edmondson, C. H., 353.
 Edsall, R. S., 542.
 Edwards, E. B., 552.
 Edwards, E. T., 74, 234.
 Edwards, F. R., 410.
 Edwards, F. W., 551.
 Edwards, J., 47.
 Edwards, J. K., 418.
 Edwards, M. J., 632.
 Edwards, P. R., 419, 420, 712, 857.
 Edwards, R. R., 852.
 Egaña, E., 620.
 Elchel, B., 31.
 Eichmann, R. D., 39.
 Eigtli, O. J., 32.
 Elncrson, A., 574.
 Einset, J., 611.
 Eisenmenger, W. S., 27, 769, 702, 800.
 Eke, P. A., 437, 729.
 Eklund, C. M., 274.
 Ekstrom, V. A., 584.
 Elder, C., 108, 717.
 Eldredge, J. C., 214.
 Eldridge, K. E., 616.
 Ellenberg, M., 315, 804.
 Ellenberger, H. B., 442, 563, 843.
 Ellenwood, C. W., 516, 517, 518.
 Elliker, P. R., 415, 704, 709.
 Elliott, C., 73, 683.
 Elliott, F. I., 47, 846.
 Elliott, S. M., 573.
 Ellis, D. E., 66.
 Ellis, L. S., 612.
 Ellis, M. D., 740.
 Ellis, M. M., 740.
 Ellis, N. K., 180, 668.
 Ellis, N. R., 98.
 Ellison, L., 505.
 Ellison, W. D., 322.
 Ellsworth, M. W., 158.
 Elrod, J. C., 808.
 Elrod, R. P., 70.
 Elvchjem, C. A., 11, 137, 150, 310, 409, 450, 457, 558, 570, 599, 698, 702, 718, 746, 839, 840, 893, 894.
 Elvove, J. T., 300.
 Elwell, H. M., 638.
 Elwood, R. B., 132.
 Ely, R., 763.
 Embleton, H., 102, 443, 869.
 Emerson, G. A., 745, 751.
 Emerson, R., 42, 485.
 Emerson, R. A., 32, 57.
 Emery, F. E., 655.
 Emmel, M. W., 127, 851, 859.
 Emmert, E. M., 196, 222.
 Emmott, A. D., 10, 762.
 Engberg, C. A., 184.
 Engel, R. W., 698.
 Engelman, G., 732.
 Engle, J. B., 644.
 Englehorn, A. J., 183, 283.
 Englerth, G. H., 543.
 English, P. F., 546.
 Ennis, W. B., 513.
 Ennis, W. B., Jr., 220.
 Ensminger, 278.
 Ensminger, L. E., 185, 632.
 Ensminger, M. E., 97, 404.
 Enzie, J. V., 801.
 Enzie, W. D., 58.
 Epple, W. F., 704.
 Epps, W. M., 67.
 Eppson, H. F., 37.
 Erb, J. H., 108.
 Erb, R. E., 360, 655.
 Erber, M., 427.
 Erdman, H. E., 440.
 Erickson, E. L., 504.
 Erickson, F. J., 18, 763.
 Erstavik, E. M., 529.
 Errington, B. J., 274.
 Errington, P. L., 245, 544, 719.
 Erwin, A. T., 212, 220, 669.
 Esaki, T., 89.
 Escue, R. B., 145.
 Espe, D. L., 105, 263, 267.
 Espinasse, P. G., 206.
 Esselen, W. B., Jr., 605, 760, 761.
 Essig, E. O., 549, 821.
 Eitchells, J. L., 18, 19.
 Etheredge, M. F., 335.
 Etheridge, W. C., 32, 52.
 Ettesvold, W. L., 135, 284, 730, 871.

- Evans, A. C., 94.
 Evans, A. W., 240.
 Evans, C. A., 571.
 Evans, E. A., 454.
 Evans, F. C., 717.
 Evans, F. R., 192.
 Evans, H. H., 528.
 Evans, H. M., 106, 266, 267,
 361, 362, 404, 501, 503, 655,
 749, 789, 834.
 Evans, J. W., 138, 327, 328.
 Evans, R. E., 408.
 Evans, R. J., 219, 404, 469,
 841, 882.
 Evans, R. M., 285, 292.
 Evans, S. T., 568.
 Eveleth, D. F., 212, 716.
 Evenson, O. L., 331.
 Everett, J. W., 655.
 Everett, N. B., 658.
 Everly, R. T., 550.
 Everson, G. J., 596.
 Everson, L. E., 512.
 Ewan, J., 32.
 Ewart, W. H., 90.
 Ewer, D. W., 95, 550.
 Ewer, R. F., 550.
 Eyer, J. E., 248.
 Eyster, H. C., 32.
 Fabian, F. W., 18, 19, 270,
 763, 850, 887.
 Fabricius, N. E., 264.
 Faes, H., 802.
 Fahey, J. E., 694.
 Fairbanks, B. W., 496, 554,
 564.
 Fairén A., M., 458.
 Falconer, J. I., 284, 584.
 Fales, A. L., 720.
 Fales, C., 654.
 Fales, J. H., 254.
 Fallscheer, H., 372, 393, 395.
 Fargo, J. M., 98, 554.
 Farish, L. R., 58, 221.
 Farmer, C. J., 460.
 Farnham, C. H., 482.
 Farr, W. K., 42, 318.
 Farrall, A. W., 728.
 Farrar, C. L., 546.
 Farrar, M. D., 247, 545, 573.
 Farrell, F. D., 900.
 Farrell, K. T., 891.
 Farrell, M. A., 686.
 Farrington, F. N., 187.
 Farrington, R. A., 504.
 Farris, E. J., 498.
 Fassig, W. W., 393.
 Fauber, H., 662, 669.
 Fawcett, D. W., 499.
 Fawcett, H. S., 542, 817.
 Fawcett, K. I., 180, 659, 668,
 730.
 Fay, R. W., 249.
 Feagan, R. A., Jr., 171.
 Feinberg, S. M., 193.
 Feiner, R. R., 567.
 Feldman, W. H., 114.
 Fellers, C. R., 34, 468, 605,
 760, 761, 820, 837, 860,
 891.
 Fellowes, O. N., 34.
 Fellows, H., 219, 234, 511.
 Felt, C., 475.
 Felt, E. P., 830.
 Felton, M. W., 680.
 Fenn, F. U., 97, 554, 873.
 Fennah, R. G., 551.
 Fenske, L. J., 437, 729.
 Fenstermacher, R., 850.
 Fenton, F., 751, 895.
 Fenton, F. A., 248.
 Fenton, F. C., 125.
 Ferguson, F. F., 472.
 Ferguson, L. C., 854.
 Fernández, M. C., 213.
 Ferris, E. B., 159, 632.
 Ficht, G. A., 694.
 Fichter, E. 656.
 Fieger, E. A., 840.
 Field, H., Jr., 149.
 Field, J. H., 657.
 Field, J. B., 698.
 Fielder, V. B., 583.
 Fields, K. E., 632.
 Ficennes, R. N. T.-W., 118.
 Fifield, W. M., 791, 799.
 Fidge, F. H. J., 600.
 Fillinger, G. A., 305, 513.
 Filley, W. O., 805, 860.
 Filmer, R. S., 696.
 Finch, A. H., 224.
 Fincher, M. G., 47, 846.
 Fincke, M. L., 143.
 Findlay, W. P. K., 544.
 Findlen, P. J., 129.
 Fink, D. S., 213, 264.
 Finkelstein, H., 421.
 Finn, S. B., 598.
 Finney, D. J., 825.
 Firbas, F., 776.
 Firkins, B. J., 183, 642.
 Fischer, G. W., 378.
 Fisher, C. K., 250.
 Fisher, H., 151, 720.
 Fisher, H. S., 803.
 Fisher, K. C., 201.
 Fisher, R. A., 694, 766.
 Fisher, W. S., 400.
 Fishman, M., 203.
 Fister, L. A., 367, 371.
 Fitch, H. S., 694.
 Fitch, J. B., 264, 704.
 Fitting, H., 776.
 Fitzgerald, R. J., 33.
 Fitzpatrick, R. E., 62.
 Fitzpatrick, W. H., 761.
 Flanders, S. E., 89, 247, 553,
 821.
 Fleck, E. E., 477.
 Fleming, C. E., 130, 662, 705.
 Fleming, H. K., 513.
 Flemion, F., 648.
 Fletcher, A. H., 608.
 Fletcher, D. G., 527.
 Fletcher, H. M., 319, 754.
 Fletcher, L. A., 874.
 Fletcher, S. W., 600.
 Fletcher, W. F., 675.
 Flint, L. H., 31, 651.
 Flint, O. S., 858.
 Flint, W. P., 503, 516, 545.
 Flock, R., 827.
 Flor, H. H., 654.
 Flory, W. S., Jr., 47, 804.
 Fluke, C. L., 546, 612.
 Fogelberg, N., 295.
 Fogle, H. G., 660.
 Folch, P. A., 725.
 Földes, F., 145.
 Foley, E. J., 714.
 Folley, G. E., 225.
 Folley, S. J., 705, 845.
 Follis, R. H., Jr., 597.
 Folsom, D., 228, 685.
 Folsom, J. C., 288.
 Fontaine, F. B., 776.
 Fontaine, T. D., 141.
 Fontana, B. J., 474.
 Foot, A. S., 406.
 Foot, R. J., 288.
 Forbes, E. B., 99, 554.
 Forbes, I. L., 75.
 Forbes, T. R., 499.
 Ford, O. W., 174, 330, 477,
 668.
 Ford, R. N., 889.
 Ford, Z., Jr., 698.
 Forrest, S. S., 331.
 Forsee, W. T., Jr., 768, 791.
 Forster, H. C., 21, 233.
 Forsyth, D. D., 367.
 Forward, D. F., 31.
 Foseland, R. G., 209.
 Fossum, M. T., 203.
 Foster, A. O., 419, 570.
 Foster, A. S., 43.
 Foster, E. G., 892.
 Foster, E. M., 413, 708.
 Foster, G. H., 725.
 Foster, H. H., 76, 680.
 Foster, J. W., 202.
 Foster, R. E., 90.
 Foster, W. A., 573.
 Foster, W. C., 178.
 Foster, W. R., 528.
 Foulks, J. G., 654.
 Fountaine, F. C., 264, 703.
 Fourt, D. L., 703, 709.
 Fouts, E. L., 842.
 Fowler, H. C., 290.
 Fowler, T. E., 518.
 Fowler, W. M., 310, 455.
 Fox, K. R., 462.
 Fox, R. L., 792.
 Fox, S. W., 4.
 Foxlee, H. R., 90.

- Fraenkel-Conrat, H. L., 267, 361, 362, 501, 503.
 Frame, B. H., 129, 733.
 Frame, N. T., 588.
 Frampton, V. L., 67, 237, 620.
 Fran, H., 760.
 France, R. L., 760.
 Francis, G. M., 296.
 Franck, J., 202, 471, 649.
 Frandsen, J. H., 842.
 Frankenberg, G. B., 320.
 Franklin, E. R., 131.
 Franklin, H. J., 820, 860.
 Franklin, M. C., 565.
 Franssen, C. J. H., 402.
 Franzke, C. J., 504, 564.
 Fraps, G. S., 8, 225, 330.
 Fraps, R. M., 502.
 Frayser, M. E., 608.
 Frazier, J. C., 31, 32, 485.
 Frazier, W. C., 413, 708.
 Frear, D. E. II., 479, 827.
 Frear, G. L., 30.
 Freeborn, S. B., 610.
 Freeman, J. F., 345.
 Freeman, M., 111.
 Freeman, M. E., 139, 760.
 Freeman, R. C., 583, 608.
 Freeman, T. R., 842.
 Freeman, V. A., 836.
 Frei, P., 98, 739.
 French, A. P., 800.
 French, C. S., 32, 202, 649.
 French, G. T., 252.
 French, O. C., 581.
 French, R. B., 593, 880.
 Freundlich, H., 650.
 Frey, C. N., 595.
 Filberg, W. R., 725.
 Fried, I., 760.
 Fried, K., 370.
 Friend, R. B., 805, 822.
 Friend, W. H., 376.
 Frischle, K. A., 466.
 Fritz, R. F., 247, 547.
 Froker, R. K., 293.
 Fronk, W. D., 548.
 Frost, D. V., 150, 570, 718.
 Frost, S. W., 824.
 Frothingham, E. II., 524.
 Fruton, J. S., 471.
 Fudge, B. R., 799.
 Fudge, J. F., 225.
 Fuelleman, R. F., 52, 503.
 Fuhrman, W. U., 733.
 Fullaway, D. T., 89, 554.
 Fuller, F. D., 405.
 Fuller, H. J., 648.
 Fuller, J. E., 760, 769.
 Fuller, V., 135, 877.
 Fuller, W. H., 193.
 Fulllove, W. T., 868.
 Fulmer, E. I., 176.
 Fulton, J. P., 385.
 Fulton, R. W., 814.
 Fufts, J. L., 191, 208.
 Funk, E. M., 85, 98, 102, 141.
 Gadd, C. H., 390, 543.
 Gacssler, W. G., 105, 214.
 Gaffron, H., 471.
 Gahan, A. B., 402.
 Gahley, E. G., 47, 98.
 Galley, F. B., 746.
 Gaines, E. F., 367, 378.
 Gaines, J. C., 821.
 Gaines, J. G., 76.
 Gaines, W. L., 265, 562.
 Galney, P. L., 688.
 Gaiser, R. N., 504.
 Gallup, W. D., 410, 841.
 Gambrell, F. L., 822, 831.
 Garassini, L. A., 485.
 Garcia, F., 465.
 Garcia Fortuño, M., 680.
 Garcia-Rada, G., 688.
 Gard, L. E., 504.
 Gardner, R., 188, 217, 519, 642, 774.
 Gardner, V. R., 755, 766.
 Gardner, W. U., 266, 654.
 Garey, J. C., 413, 704.
 Garey, L. F., 134, 441.
 Garin, G. I., 376.
 Garland, W., 820.
 Garlough, F. E., 431, 544.
 Garner, R. J., 670.
 Garnett, W. E., 302.
 Garrard, E. H., 106.
 Garrett, O. F., 562, 848.
 Garrett, S. D., 882.
 Garrison, C. S., 369, 508.
 Garrison, E. K., 847.
 Garrison, O. B., 367, 371, 428.
 Garriss, H. R., 66.
 Garstka, W. U., 182.
 Garthwaite, P. F., 305, 549.
 Garver, H. L., 124.
 Gary, W. Y., 330.
 Gastler, G. F., 612.
 Gaston, H. P., 62, 223.
 Gates, F. C., 485, 798.
 Gates, G. E., 86.
 Gates, R. H., 494.
 Gault, L., 330, 775.
 Gaumnitz, E. W., 285.
 Gautheret, R. J., 196.
 Gavin, G., 146.
 Gay, C. B., 184.
 Gay, F. E., 281.
 Gay, W. J., 423.
 Gaylord, F. C., 180, 223, 659, 668, 730.
 Geddes, W. F., 54.
 Gehlbach, M. P., 583.
 Geigel, L. M., 284, 290.
 Geiger, M. J. T., 786.
 Geiger, W. B., 157.
 Geissler, G. H., 247.
 Gelpi, A. J., 848.
 Genaux, C. M., 226.
 Genest, M. E., 395.
 Gentner, L. G., 824.
 George, L. V., 467.
 George, W. C., 655.
 Gerdes, F. L., 581, 863.
 Gerhardt, F., 67.
 Gerlach, C., 546.
 Gerritz, H. W., 330.
 Gersdorff, C. E. F., 139.
 Gertler, S. I., 253.
 Getting, V. A., 117.
 Getzendaner, C. W., 393.
 Geyvorkiantz, S. R., 804.
 Geyer, R. P., 137.
 Gibbon, H., 48.
 Gibbons, R. J., 110.
 Gibson, C. A., 108.
 Gibson, E. V., 710.
 Gibson, J. W., 202.
 Gibson, K. E., 398.
 Gieger, M., 144, 887.
 Giese, H., 129, 277, 283, 582.
 Gieseler, L. F., 99, 769.
 Gieseking, J. E., 185.
 Gifford, R. P., 610, 716.
 Gikashvili (Gulkashvili), K. G., 529.
 Gilbert, B. L., 268.
 Gilbert, C. H., 468, 822.
 Gilbert, C. S., 37.
 Gilbert, R. W., 643.
 Gilbert, S. G., 462, 782.
 Gile, B. M., 269.
 Giles, D. D., 502.
 Giles, L. W., 391.
 Gilgut, C. J., 408, 806.
 Gillis, M. B., 99, 409.
 Gilly, C. L., 32.
 Gilmore, J. W., 466.
 Gilyard, A. T., 857.
 Gilyard, R., 857.
 Ginsburg, J. M., 826.
 Girth, H. B., 392.
 Girtton, R. E., 42.
 Gish, C. L., 467.
 Gish, P. T., 484.
 Gist, M. N., 791.
 Gitsvold, O., 37.
 Gribbenet, E. R. (Hubbenet, E.), 357.
 Glading, B., 694.
 Glaser, R. W., 392.
 Glass, E. H., 400.
 Glasscock, H. H., 383.
 Glasstone, V. F. C., 492, 813.
 Glendenning, G. E., 506.
 Glick, D., 454.
 Glick, D. P., 238, 666.
 Glistler, G. A., 487.
 Glock, G. E., 747.
 Glock, W. S., 67, 803.
 Gluecksohn-Schoenheimer, S., 361.
 Glycart, C. K., 330.
 Gobble, C. F., 725.
 Godbey, E. G., 403.
 Godden, W. J., 458.

- Godfrid, M., 789.
 Göes, O. C., 44.
 Goettsch, M., 896.
 Goff, O. E., 275, 418.
 Golden, S. R., 545.
 Golden, W. R. C., 790, 838.
 Goldhamer, S. M., 454.
 Golding, N. S., 411.
 Goldsborough, G. H., 134.
 Goldsmith, G. A., 153.
 Goldsworthy, M. C., 531, 681.
 Gomez, E. T., 103, 265, 654.
 Gómez, L. A., 205, 221, 465.
 Gonçalves, L. I., 236.
 Gonçalves-Silva, S., 82.
 Good, N. E., 553.
 Goodall, D. W., 515.
 Goodearl, G. P., 702, 841.
 Gooden, E. L., 396.
 Goodey, T., 392, 533, 539.
 Goodhart, R., 602.
 Goodhue, L. D., 254, 547, 821.
 Gooding, E. G. B., 350.
 Goodliffe, F. D., 394.
 Goodspeed, T. H., 347, 786.
 Goodwin, K. R., 277.
 Goodwin, M. W., 17, 105, 227, 245.
 Gopal-Ayengar, A. R., 31.
 Gordon, E. D., 122.
 Gordon, H. M., 392, 850.
 Gordon, H. S., 729.
 Gordon, R. M., 111.
 Gore, U. R., 216.
 Gorcslane, H. E., 703.
 Gorrie, C. J. R., 571.
 Goss, R. W., 72.
 Gossard, A. C., 817.
 Goudey, R. F., 725.
 Gould, E., 247.
 Gould, G. E., 694.
 Gould, H. P., 675.
 Gould, I. A., 762, 850.
 Gourley, C. O., 100.
 Gowan, E. H., 493.
 Gowe, D. F., 153.
 Gowen, J. W., 44, 209, 270, 408.
 Goyco, J. A., 165, 213.
 Graber, L. F., 504, 574.
 Graf, H., 272.
 Grafflin, A. L., 655.
 Graffius, J. E., 504.
 Graham, C., 393.
 Graham, E. R., 25, 32.
 Graham, J. S., 768.
 Graham, R., 117, 274, 277, 564, 853, 856.
 Graham, R. E., Jr., 280.
 Graham, T. W., 70, 378.
 Graham, W. R., Jr., 103.
 Graham-Smith, G. S., 418.
 Grahame, T., 857.
 Grainger, T. H., 710.
 Grandstaff, J. O., 208.
 Grant, T. J., 380.
 Grantham, G. M., 611.
 Grasovsky, Y. S., 275.
 Gratz, L. O., 538, 806.
 Graves, A. H., 83.
 Graves, L. M., 608.
 Graves, R. R., 705, 844.
 Gray, G., 897.
 Gray, G. F., 520.
 Gray, J. A., 717.
 Gray, K. W., 391.
 Gray, N. E., 648.
 Gray, R. B., 430.
 Gray, T. D., 476.
 Gray, W. D., 35.
 Greaney, F. J., 233, 532, 687.
 Greaves, J. E., 28, 626, 637.
 Greblinsky, S. O., 37.
 Greeley, S. A., 726.
 Green, A. W., 588.
 Green, D. E., 471.
 Green, E. L., 48, 531, 681.
 Green, J., 189.
 Green, L. F., 466, 616.
 Green, M. C., 48.
 Green, R. G., 571, 858.
 Green, W. W., 209, 657.
 Greenawalt, R. D., 25.
 Greenberg, D. M., 747.
 Greene, H. S. N., 501.
 Greene, P. S., 322.
 Greene, R. R., 499, 789.
 Greenfield, S. S., 493.
 Greenlaw, J. P., 877.
 Greenleaf, C. A., 330.
 Greenslade, R. M., 251, 252, 399, 402.
 Greenwald, M., 95.
 Greenwood, A. W., 49.
 Greep, R. O., 51.
 Greer, W., 487.
 Gregory, P. W., 208, 209, 656.
 Gregson, J. D., 90, 97.
 Greisen, E. C., 32, 109, 420.
 Greisinger, P., 438.
 Gresson, R. A. R., 48.
 Greulach, V. A., 30, 356.
 Greve, E. W., 220, 671.
 Griem, W. B., 331.
 Gries, G. A., 466.
 Griffee, F., 322.
 Griffen, A. B., 363.
 Griffith, R. L., Jr., 273.
 Griffith, W. H., 454.
 Griggs, R. F., 631.
 Grigsby, R. M., 291.
 Grimes, M., 847.
 Grimes, M. A., 318.
 Grimes, W. E., 130.
 Grimmett, R. E. R., 492.
 Grinnells, C. D., 14, 706.
 Griswold, G. H., 90, 94, 247.
 Griswold, R. M., 140.
 Grizzard, A. L., 793.
 Grogan, R. G., 491, 539.
 Groskin, L., 564.
 Gross, G., 564.
 Gross, P., 147.
 Groves, A. B., 540.
 Groves, K., 372, 393, 404, 418.
 Grundy, W. E., 33.
 Grüneberg, H., 48, 497.
 Guba, E. F., 806.
 Guernsey, J. E., 182.
 Guerrant, N. B., 114, 589.
 Guilbert, H. R., 258, 698.
 Guin, M., 284, 730, 876.
 Gulscafré Arrillaga, J., 221, 465, 668.
 Gukova, M. M., 777, 784.
 Gullickson, T. W., 264.
 Gunder, D. F., 574.
 Gunderson, H., 820.
 Gunn, D. L., 95, 550.
 Guinness, C. I., 281, 800, 837, 860.
 Gunsalus, I. C., 32, 47, 104, 623.
 Gustafson, A. F., 483.
 Gustafson, F. G., 38, 673.
 Gustavson, R. G., 50.
 Guterman, C. E. F., 324.
 Guthrie, E. S., 4, 104, 269.
 Guthrie, J. D., 39, 645.
 Guthrie, T. C., 900.
 Gutowska, M. S., 559, 837, 838.
 Guttentag, C., 31.
 Guyton, T. L., 252, 547.
 Gwin, J. M., 467, 586.
 György, P., 151, 624.
 Haag, H. M., 443.
 Haag, J. R., 404.
 Haagen-Smit, A. J., 778.
 Haas, A. R. C., 27, 64.
 Haas, H. J., 900.
 Haasis, F. A., 67, 82.
 Haber, E. S., 208, 217, 220, 221.
 Habermann, R. T., 570.
 Hackedorf, H., 835.
 Hackleman, J. C., 503.
 Hadary, G., 416.
 Haddock, D., 284.
 Haddock, J. L., 632.
 Haddow, W. R., 245.
 Haden, R. L., 312.
 Haenni, E. O., 330, 336.
 Haenseler, C. M., 815.
 Haertl, E. J., 31.
 Haferbecker, H. N., 505.
 Hagen, G., 478.
 Hagmann, L. E., 90.
 Hague, E., 625.
 Hahn, A. J., 850.
 Hahn, B. E. F., 29.
 Haigh, L. D., 347, 775.
 Haldane, J. B. S., 786.
 Hale, R. W., 409.
 Haley, D. E., 33, 504, 686.
 Hall, D., 756.
 Hall, E. E., 386.

- Hall, J. W., 775.
 Hall, S. W., 523.
 Hall, W. J., 119.
 Haller, H. L., 253, 681, 830.
 Hallman, L. F., 309, 844.
 Halma, F. F., 875.
 Halman, E. T., 262.
 Halnan, E. T., 837.
 Halpin, J. G., 554, 840.
 Halton, P., 304.
 Halversen, W. V., 703, 709, 725, 898.
 Hamblin, I. E., 216.
 Hamburger, J. J., 140.
 Hamilton, A. B., 132.
 Hamilton, C. C., 307, 828.
 Hamilton, C. M., 93, 119.
 Hamilton, J. M., 67, 323, 531, 815.
 Hamilton, T. S., 405, 406, 496, 554, 834.
 Hamilton, W. J., Jr., 85, 86.
 Hammar, C. H., 582.
 Hammer, B. W., 263, 268, 269, 762, 847, 849.
 Hammerberg, D. O., 872, 873.
 Hammon, W. M., 117, 711, 717.
 Hammond, J., 47.
 Hammond, J. C., 262, 263, 559, 810.
 Hammond, J. W., 345.
 Hammond, L. D., 175.
 Hamner, C. L., 39.
 Hamner, M. E., 352.
 Hamre, C. J., 274.
 Hamstead, E. O., 247.
 Hance, F. E., 174.
 Hancock, B. L., 358.
 Hancock, N. I., 367, 663.
 Hand, D. B., 32, 104, 623.
 Hand, I. F., 482.
 Handler, P., 14.
 Hangas, A. J., 129.
 Hanke, A. R., 555.
 Hankins, O. G., 556.
 Hanna, W. J., 29.
 Hansberry, T. R., 90.
 Hansen, E., 355.
 Hansen, E. L., 573.
 Hansen, E. N., 209, 263.
 Hansen, H. C., 337, 703.
 Hansen, H. N., 35, 70, 104, 650, 817.
 Hansen, N. E., 513, 528.
 Hansing, E. D., 67.
 Hanson, A. J., 92.
 Hanson, E. A., 203.
 Hanson, H. L., 881.
 Hanson, L. E., 99.
 Haralson, F. E., 670.
 Harbour, H. E., 272.
 Hardenburg, E. V., 53, 58, 507.
 Harder, R., 776.
 Hardesty, J. O., 330, 334.
 Hardin, C. M., 291, 293, 730.
 Hardin, L. J., 345.
 Harding, T. S., 302.
 Hardy, J. D., 307.
 Hardy, J. I., 101, 558.
 Hardy, M. C., 888.
 Hardy, T. M. P., 558.
 Hare, W. W., 513, 528.
 Harlan, J. R., 31.
 Harley, C. P., 372, 374.
 Harley, R., 568.
 Harlow, W. M., 42.
 Harman, S. W., 402, 829.
 Harmer, P. M., 189, 198.
 Harms, A., 558.
 Harper, C., 98, 556, 697.
 Harper, F. A., 129.
 Harper, H. J., 687.
 Harper, R. M., 777.
 Harrar, J. G., 67.
 Harrell, D. C., 367.
 Harrell, F. M., 366.
 Harrell, G. D., 340.
 Harriman, L. A., 34.
 Harrington, J. F., 58.
 Harrington, J. L., 213.
 Harris, G. D., 616.
 Harris, H. C., 212.
 Harris, K., 509.
 Harris, K. W., 880.
 Harris, L. E., 98, 708, 900.
 Harris, L. J., 762, 763.
 Harris, M., 157, 158, 463.
 Harris, M. C., 338.
 Harris, P. L., 892.
 Harris, R. H., 55, 512, 627.
 Harris, R. S., 620.
 Harris, R. V., 541.
 Harris, T. H., 33.
 Harrison, C. M., 223, 261.
 Harrison, E., 788.
 Harrison, E. S., 47, 103.
 Harrison, J., 566, 900.
 Harrison, J. R., 176.
 Harrison, T. B., 411.
 Harrison, W. H., 330.
 Harshbarger, K. E., 306.
 Harshfield, G. S., 116.
 Hart, E. B., 137, 409, 718, 839.
 Hart, G., 330.
 Hart, G. H., 698.
 Harter, L. L., 382, 385, 528.
 Hartman, G. H., 848.
 Hartman, H., 523.
 Hartman, J. D., 223, 668.
 Hartmann, B. G., 330.
 Hartsel, S. E., 709.
 Hartwig, H. B., 53, 120.
 Hartz, G. J., 335.
 Hartzell, A., 87.
 Hartzler, E. R., 891.
 Harvey, W. A., 367.
 Haseman, L., 85, 393, 694.
 Haskell, R. J., 238.
 Hassall, A., 850.
 Hassid, W. Z., 783.
 Hastings, S. H., 860.
 Haterius, H. O., 655.
 Hatfield, J. D., 97, 466.
 Hathaway, G. A., 631.
 Hauck, C. W., 440.
 Hauge, S. M., 105, 697, 704.
 Hauser, E. R., 700.
 Havis, A. L., 31, 63, 516.
 Hawk, V. B., 367.
 Hawkins, 283.
 Hawkins, A., 213, 217, 228.
 Hawkins, B. S., 378, 807.
 Hawkins, J. H., 248.
 Hawkins, L. E., 612, 700.
 Hawkins, R. S., 509, 899.
 Hawley, R. C., 677.
 Hawthorne, H. W., 286.
 Hay, R. C., 573.
 Haydak, M. H., 401, 828.
 Hayden, A., 101.
 Hayman, R. E., 133.
 Hays, F. A., 788.
 Hays, J. R., 287.
 Hays, M. B., 320.
 Hayward, K. J., 402.
 Hazel, L. N., 209.
 Hazen, E. L., 720.
 Hazen, L. E., 579.
 Hazen, M. W., 98.
 Hazlewood, R. P., 367, 404.
 Headley, F. B., 287, 835.
 Heal, R. E., 825.
 Heald, F. D., 378.
 Heath, L. M., 571.
 Heath, M., 212.
 Hebert, T. T., 66.
 Hecht, A., 31.
 Heck, M., 47.
 Hedges, B., 801.
 Hedreen, C., 151.
 Hedrick, T. I., 849.
 Heggeness, H. G., 235.
 Heggie, R., 15.
 Hegsted, D. M., 409, 839.
 Hehn, E., 612.
 Held, J. L., 17.
 Heldenthal, G., 498.
 Hellman, D., 33.
 Heimbürger, C. C., 65.
 Hein, M. A., 793.
 Heinemann, M., 317.
 Heinicke, A. J., 61, 324, 899.
 Heinze, P. H., 4, 40, 357.
 Helse, A. C., 512.
 Helsing, C. P., 436.
 Helsing, G. B., 177.
 Helt, C. E., 226, 512, 513.
 Heltsbu, D. C., 277.
 Helzer, E., 574.
 Helgeson, E. A., 57, 197, 607, 700.
 Heller, V. G., 561, 617, 702.
 Hellman, N. N., 483.
 Helm, C. A., 52, 98, 627.

- Helser, M. D., 200, 256, 283, 303.
 Hely, P. C., 240.
 Hemingway, A., 166, 168, 348.
 Henderson, E. W., 764.
 Henderson, H. B., 411.
 Henderson, H. O., 715.
 Henderson, J. A., 115.
 Henderson, J. R., 760, 768.
 Henderson, L. M., 150.
 Henderson, M. E., 713.
 Henderson, P. A., 129.
 Henderson, R. W., 527.
 Henderson, S. M., 133.
 Henderson, V., 155.
 Hendricks, J. W., 344.
 Hendrickson, A. H., 27, 518.
 Hendrickson, G. O., 245.
 Hendrickson, P. A., 335.
 Hendrix, W. E., 132.
 Henke, L. A., 98.
 Hennefrund, H. E., 287, 288.
 Hennessy, D. J., 8.
 Henning, G. F., 284, 298, 584.
 Henning, M., 214.
 Henning, W. L., 554.
 Henry, B., 524, 528.
 Henry, D. L., 729.
 Henry, K. M., 142, 304.
 Henry, R. L., 616.
 Hensley, H. C., 441.
 Henson, M., 655.
 Hepner, F. E., 768.
 Herb, M. I., 293.
 Herbert, D. A., 243.
 Herman, H. A., 47, 103, 704.
 Herms, W. B., 89.
 Hernández, M., 284.
 Hernández Medina, E., 617, 679.
 Herreid, E. O., 104, 563, 707.
 Herrell, W. E., 33.
 Herrera, F. L., 777.
 Herrick, A. M., 676.
 Herrick, C. A., 119.
 Herrick, J. A., 486, 808, 809.
 Herring, V., 103.
 Herring, V. V., 362, 503.
 Herrington, B. L., 4, 414.
 Herrington, W. A., 583.
 Herrmann, L. F., 295.
 Hershey, A. L., 32.
 Hertel, K. L., 367.
 Herzfeld, K. F., 649.
 Hess, W. C., 5.
 Hessel, F. H., 11.
 Heater, H. R., 564, 856.
 Hetrick, L. A., 832.
 Hetzer, H. O., 98.
 Heuberg, J. W., 68, 70, 230, 380, 688.
 Heuser, G. F., 99, 257, 276, 409, 560.
 Heusinkveld, D., 545.
 Hewitt, B., 359.
 Hewston, E. M., 6, 891.
 Heys, F. M., 567.
 Hibbard, A. D., 32, 60, 670.
 Hickey, R. J., 176.
 Hickman, C. W., 98, 697, 739.
 Hickman, K. C. D., 892.
 Hickok, R. B., 725.
 Hicks, E. A., 545.
 Hinton, T. E., 694, 697, 725.
 Hiesey, W. M., 485.
 Hiestand, W. A., 655.
 Higgins, F. C., 315.
 Highlands, M. E., 220.
 Hightower, L. E., 52, 120, 727.
 Higinbotham, N., 468.
 Hilborn, M. T., 220, 228, 693, 812.
 Hildebrand, A. A., 236.
 Hildebrand, E. M., 67, 81, 530, 541, 689, 691, 816.
 Hille, R. B., 286.
 Hilleman, J. L., 707.
 Hill, A. J., 431.
 Hill, G. W., 736.
 Hill, J. A., 468, 899.
 Hill, J. H., 33.
 Hill, R., 356.
 Hill, R. T., 51.
 Hill, S. O., 822.
 Hiller, D. S., 300.
 Hills, C. H., 384.
 Hills, O. A., 394.
 Hilton, J. H., 655, 704, 709, 725.
 Hilton, R. J., 670.
 Hinds, H. B., 102, 701.
 Hinkle, D. A., 368.
 Hinman, E. H., 696.
 Hinman, F. G., 694.
 Hinman, R. B., 99.
 Hinnens, S. W., 725.
 Hinshaw, W. R., 426, 858.
 Hinton, H. E., 551.
 Hinton, S. A., 411.
 Hirane, S., 83.
 Hirsch, A. A., 354.
 Hirsch, E., 505.
 Hirschhorn, E., 230.
 Hirt, R. R., 83.
 Hitchcock, A. E., 32.
 Hitchner, E. R., 34.
 Hitt, H. L., 877.
 Hitz, C. W., 467.
 Hixon, R. M., 165, 214, 303, 327.
 Hixson, E., 369.
 Hlynka, I., 108, 269, 707.
 Hoagland, R., 449.
 Hobbs, C. S., 47, 99.
 Hobby, G. L., 33.
 Hoblyn, T. N., 670.
 Hochmuth, H. R., 181.
 Hock, C. W., 157, 649.
 Hockley, H. A., 133.
 Hodge, E. S., 610.
 Hodge, H. C., 462, 598.
 Hodges, J. E., 441.
 Hodgkiss, W. S., 330, 610.
 Hodgson, R. E., 265, 343, 411, 640, 843.
 Hodgson, R. W., 521.
 Hodson, A. C., 553.
 Hodson, A. Z., 85, 858.
 Hoecker, W. H., 268, 762.
 Hoerner, I. R., 503.
 Hoerlein, A. B., 116.
 Hoerner, G. R., 238.
 Hofer, A. W., 222, 539.
 Hoffer, C. R., 738, 879.
 Hoffman, C., 532.
 Hoffman, C. C., 255.
 Hoffman, C. H., 92.
 Hoffman, H. A., 419, 571.
 Hoffman, J. C., 59.
 Hoffman, M. B., 61, 672.
 Hoffman, M. M., 789.
 Hoffsummer, H., 738, 878.
 Hofmann, K., 624, 625.
 Hofstad, M. S., 853.
 Hogan, A. G., 98, 101, 145, 147, 410, 748, 839.
 Hogenson, C. J., 612.
 Hogg, P. G., 479.
 Hogness, T. R., 454.
 Hohl, L. A., 181, 473.
 Hokenstad, N., 555.
 Holbert, J. R., 550.
 Holdaway, C. W., 704.
 Holdbridge, L. R., 803.
 Holland, E. B., 330.
 Hollander, W. F., 657.
 Hollands, H. F., 436, 611.
 Hollembæk, H. D., 663.
 Hollenbeck, C. M., 472.
 Hollender, H. A., 413.
 Holley, K. T., 836.
 Holloway, E. E., 89.
 Hollowell, E. A., 795.
 Holm, G. C., 273, 697, 703, 709.
 Holman, H. H., 856.
 Holmes, A. D., 138, 457.
 Holmes, C. E., 119, 555, 840.
 Holmes, J. L., 700.
 Holt, D. H., 505.
 Holt, L. E., Jr., 750.
 Holtman, D. F., 33.
 Holton, C. S., 71, 72, 378, 687.
 Holubinsky, I. N., 781.
 Holyoke, E. A., 655.
 Holzapel, L., 69, 471.
 Holzman, B., 340.
 Honess, R. F., 273, 712, 851.
 Honeywell, E. R., 679.
 Honigshelm, P., 301.
 Hood, E. G., 108, 269, 707.
 Hook, A. E., 270.
 Hooker, C. W., 498, 654.
 Hooker, W. J., 528.
 Hoos, S., 442.
 Hoover, C. D., 866, 618.
 Hopf, H. S., 550.

- Hopkins, E. W., 34.
 Hopkins, J. A., 132, 283
 Hopp, H., 83.
 Hoppe, P. E., 377.
 Hopper, T. H., 510, 610, 836.
 Hopperstead, S. L., 227, 672.
 Hoppert, C. A., 19.
 Horgan, E. S., 115.
 Horn, C. L., 668.
 Horn, E. E., 694.
 Horn, H. W., 462.
 Horn, M. J., 166, 200.
 Hornbeck, B. L., 610.
 Horne, W. T., 35, 241.
 Horner, G. M., 343.
 Horning, E. S., 34.
 Horrall, B. E., 704, 709.
 Horsfall, J. G., 79, 230, 231, 380, 688, 805.
 Horton, D. C., 438, 583.
 Horwitz, W., 330.
 Horwood, R. E., 848.
 Hosmer, J. B., 451.
 Hossfeld, R., 474.
 Hotchkiss, R. D., 852.
 Hotson, H. H., 381.
 Houchin, O. B., 698.
 Hough, B. K., Jr., 576.
 Hough, L. F., 61.
 Hough, W. S., 254.
 Houghton Roberts, E. A., 192
 Houk, H. J., 730.
 Houseman, E. E., 766, 898.
 Houser, J. S., 824.
 Houston, B. R., 382.
 Houston, J., 304.
 Hoveland, N., 609.
 Howard, N. F., 399.
 Howard, R. S., Jr., 697.
 Howe, P. E., 616.
 Howell, C. E., 852.
 Howell, D. E., 89.
 Howitt, B. F., 117, 566.
 Howland, A., 875.
 Howles, R., 31.
 Howlett, F. S., 515, 516, 517.
 Hoyer, D. G., 335.
 Hoyman, W. G., 805.
 Hoynak, S., 193.
 Hoyt, A. S., 87.
 Hoyt, W. G., 631.
 Hsu, H. C., 154.
 Hubbard, V. C., 125.
 Hubbell, R. B., 744.
 Hubbenet, E. (Gibbenet, E. R.), 357.
 Huber, C. P., 309.
 Huber, G. A., 372, 378, 816.
 Huber, L. L., 252, 551.
 Huber, W. H., 700.
 Huberty, M. R., 674.
 Hudson, A. C., 434.
 Hudson, C. S., 485.
 Hudson, J. R., 109, 113.
 Hudson, R. S., 97, 208, 657.
 Hudson, W. E., 126.
 Huelsen, W. A., 514.
 Huff, J. W., 601.
 Huffman, C. F., 104, 105, 412.
 Huffman, W. T., 851.
 Hughes, C. A., 121.
 Hughes, C. W., 174, 344, 466, 477.
 Hughes, E. H., 98, 209, 407, 557, 656.
 Hughes, H. D., 183, 212, 214.
 Hughes, M. B., 611.
 Hughes, R. C., 760.
 Huizinga, H., 418.
 Hull, F. H., 791.
 Hull, L. H., 30.
 Humbert, R. P., 24.
 Hume, A. N., 504, 504.
 Hume, E. P., 225.
 Hummon, O. J., 570.
 Humphreys, F. A., 110.
 Hungerford, C. W., 755.
 Hunt, E. P., 741, 743.
 Hunt, H., 166, 175, 208.
 Hunt, R. E., 98, 556.
 Hunt, T. E., 651, 658.
 Hunter, G. J. E., 850.
 Hunter, H. A., 58.
 Hunter, K. H., 439.
 Hurd, E. B., 436.
 Hurlbut, H. S., 696.
 Hurt, B. R., 297, 583, 730.
 Hurt, R. H., 541.
 Huskins, C. L., 650.
 Hussein, A. A., 339.
 Hustrulid, A., 578.
 Hutcheson, T. B., 703.
 Hutchings, B. L., 626.
 Hutchings, L. M., 466.
 Hutchins, L. M., 387.
 Hutchins, W. A., 292.
 Hutchison, C. B., 753.
 Hutner, S. H., 711.
 Hutson, R., 824, 831.
 Hutt, F. B., 47, 49, 211, 259, 363, 722.
 Huttie, M. L., 46.
 Hwang, L., 810.
 Hyde, A. S., 86.
 Hynes, H. J., 232.
 Hyre, R. A., 378, 380.
 Hyslop, G. R., 798.
 Igaravidez, L., 165.
 Ihde, A. J., 146.
 Immer, F. R., 611.
 Ingle, R. T., 712.
 Ingram, J. W., 89, 91, 93.
 Inkster, C., 720.
 Innman, B. T., 754.
 Insko, W. M., Jr., 558.
 Irizarry Rubio, G., 680.
 Irons, F., 178.
 Irreverre, F., 481.
 Irvin, C. J., 504, 641.
 Irving, J. T., 460.
 Irwin, M. R., 49, 261, 854.
 Isaacs, T. L., 331, 645, 783.
 Isarlishvili, S. A., 529.
 Isbell, H., 480.
 Isely, D., 547.
 Ishii, N., 86.
 Ishii, T., 89.
 Israelson, O. W., 726.
 Itschner, K. F., 147.
 Ittner, N. E., 98, 407, 557.
 Ives, J. R., 283, 873.
 Ivimey Cook, W. R., 191.
 Ivy, A. C., 141, 142, 499, 594.
 Izumi, E. M., 711, 717.
 Jaap, R. G., 790.
 Jablonski, C. F., 330.
 Jack, E. L., 106.
 Jack, R. W., 238, 696.
 Jackson, A. D., 899.
 Jackson, H., 900.
 Jackson, J. R., 196.
 Jackson, M. L., 483.
 Jackson, R. F., 175.
 Jackson, R. L., 601.
 Jackson, W. I., 93.
 Jacob, F. H., 93.
 Jacob, H. E., 339.
 Jacob, M., 360, 404, 690.
 Jacob, H. P., 889.
 Jacobs, J. L., 497.
 Jacobsen, D. H., 563.
 Jacobson, E. T., 445.
 Jacobson, H. G. M., 774.
 Jacques, J. E., 487.
 Jacquot, H. D., 367.
 James, R. L., 398, 399.
 James, W. O., 351, 643.
 Jamieson, W. A., 710.
 Jamison, F. S., 709.
 Jamison, V. C., 190, 768, 790.
 Janer, J. R., 447.
 Janes, R. G., 654.
 Janes, R. L., 398, 399.
 Janes, R. N., 546.
 Jardine, J. T., 755.
 Jawetz, E., 421.
 Jayaratnam, T. J., 403.
 Jefferies, J. H., 799.
 Jeffers, W. F., 241.
 Jeffrey, E. C., 31.
 Jeffrey, F. P., 701.
 Jeffries, C. D., 24.
 Jellison, W. L., 653.
 Jenkins, A. E., 70, 82, 244, 389, 530.
 Jenkins, D. R., 301, 445, 739.
 Jenkins, J. M., Jr., 371, 378, 386, 787.
 Jenkins, L., 85, 393.
 Jenkins, W. H., 366.
 Jennings, B. A., 120.
 Jennison, M. W., 34.
 Jenny, H., 186.
 Jensen, C., 707, 708.
 Jensen, C. W., 329, 418, 705.
 Jensen, G. W., 423.

- Jensen, J. H., 72.
 Jensen, N. F., 53.
 Jensen, O. G., 18.
 Jensen, R., 611.
 Jeter, H. L., 331.
 Jewett, H. H., 881.
 Jilk, L. T., 176.
 Joffe, J. S., 483.
 Joffly, J., 234.
 Johann, H., 205.
 Johannson, H., 8.
 John, M. E., 300, 580.
 Johns, I. B., 170, 249, 762.
 Johnsgard, G. A., 632.
 Johnson, A. A., 215.
 Johnson, A. G., 680.
 Johnson, C. G., 821.
 Johnson, C. R., 332, 761.
 Johnson, D. L., 668.
 Johnson, D. W., 111.
 Johnson, E. A., 111.
 Johnson, E. C., 465.
 Johnson, E. G., 430.
 Johnson, E. L., 467, 697.
 Johnson, E. M., 229, 383.
 Johnson, E. P., 116, 724.
 Johnson, F., 73.
 Johnson, G., 304, 900.
 Johnson, G. M., 330.
 Johnson, H. W., 711.
 Johnson, I. B., 554, 609.
 Johnson, I. J., 182, 183, 212, 214.
 Johnson, J., 184, 218, 379, 505, 530, 814.
 Johnson, L. E., 204.
 Johnson, L. V., 151.
 Johnson, M. J., 168, 746, 776.
 Johnson, N. W., 582, 583.
 Johnson, P., 611.
 Johnson, P. E., 482, 504, 836.
 Johnson, R. F., 697.
 Johnson, S. E., 582.
 Johnson, S. M., 871.
 Johnson, S. R., 101, 839.
 Johnson, T. J., 31, 205.
 Johnson, W. M., 635.
 Johnston, C., 844.
 Johnston, C. L., 687.
 Johnston, C. N., 861.
 Johnston, C. O., 234, 527, 680.
 Johnston, P. E., 583, 584.
 Johnston, S., 802.
 Johnstone-Wallace, D. B., 53, 99.
 Jolivette, J. P., 513, 528.
 Jolliffe, N., 890.
 Joly, R. A., 780.
 Jones, C. H., 563, 843.
 Jones, C. R., 394.
 Jones, D. B., 139, 166, 200.
 Jones, D. F., 791, 790.
 Jones, D. G., 47, 364.
 Jones, F. D., 347.
 Jones, H. A., 45, 179, 829.
 Jones, H. E., 659, 773.
 Jones, I. D., 18, 19.
 Jones, I. R., 842.
 Jones, J. W., 510.
 Jones, K. L., 33.
 Jones, L. A., 429, 576.
 Jones, L. H., 775, 806.
 Jones, L. K., 378.
 Jones, L. M., 177.
 Jones, L. W., 28, 637, 816.
 Jones, M., 180.
 Jones, M. A., 617.
 Jones, M. F., 419.
 Jones, M. G., 548.
 Jones, M. M., 52, 120, 445, 416, 727.
 Jones, P. D., 842.
 Jones, P. E., 300.
 Jones, R. L., 403.
 Jones, T. C., 117, 718.
 Jones, T. N., 216.
 Jones, U. S., 659.
 Jough, P. de, 350.
 Jordan, B., 183.
 Jordan, D. F., 210.
 Jordan, E. O., 418.
 Jordan, F. H., 728.
 Jordan, R., 740.
 Jorlin, D. F., 643.
 Josephs, H. W., 312.
 Josephson, D. V., 563.
 Josephson, H. R., 65.
 Joslyn, M. A., 16, 140, 181, 473.
 Joukovsky, V., 555.
 Joyce, F. T., 561.
 Joyce, L., 204.
 Juday, C., 171.
 Judkins, H. F., 612, 811.
 Jugenheimer, H. W., 663.
 Jukes, T. H., 839.
 Juliá, F. J., 213, 221, 229.
 Jull, M. A., 100, 408.
 Jung, R. W., 141.
 Jungeblut, C. W., 567.
 Jungherr, E., 713.
 Kudow, K. J., 220, 227, 215, 514, 672.
 Kaiser, S., 31.
 Kalamkar, R. J., 182.
 Kaliss, N., 48, 363.
 Kalmus, H., 841.
 Kaloostin, G. H., 250.
 Kamat, M. N., 528.
 Kamen, M. D., 202.
 Kamiya, N., 650.
 Kammlade, W. G., 554.
 Kanchaveli, L. A., 529.
 Kangas, L. R., 406.
 Kanipe, L. A., 512.
 Kao, H.-C., 452, 453.
 Kapel, F. J., 66.
 Kapnick, I., 271.
 Kardos, L. T., 23, 343, 372.
 Karling, J. S., 230, 808.
 Karlson, A. G., 853.
 Karnofsky, D., 105.
 Karr, W. G., 476.
 Kassanis, B., 384, 829.
 Kato, K., 315.
 Katzenelbogen, E., 746.
 Katzman, P. A., 789.
 Katznelson, H., 348.
 Kaufert, F. H., 693, 819.
 Kauffmann, F., 420.
 Kauzal, G. P., 302, 423.
 Kavanagh, F., 194, 644, 615.
 Kearney, T. H., 347.
 Kearns, C. W., 545.
 Keck, D. D., 485.
 Keenan, G. L., 330.
 Keener, H. A., 114, 562.
 Keeney, L. G., 282.
 Keiffer, H. H., 89.
 Kellholz, F. J., 609.
 Keim, F. D., 506.
 Keith, T. B., 98, 557.
 Keitt, G. W., 44, 387, 528.
 Kelbert, D. G. A., 768, 799, 806.
 Koller, W. B., 378.
 Kelley, J. B., 432.
 Kelley, J. J., 497.
 Kelley, J. R., 290.
 Kelley, R. B., 48.
 Kelley, V. W., 584.
 Kellner, A. J., 320.
 Kellogg, M., 590.
 Kelly, C. F., 580, 864.
 Kelly, J. B., 663.
 Kelly, L. L., 120.
 Kammerrer, A. R., 7, 8, 331.
 Kempf, J. E., 566.
 Kempster, E., 589.
 Kempster, H. L., 85, 98, 261.
 Kempton, J. H., 39.
 Kendrick, J. B., 692.
 Kennard, D. C., 260, 559, 581.
 Kennedy, A. L., 120, 812, 428.
 Kennedy, B. B., 137.
 Kennedy, J. A., 34.
 Kennedy, J. S., 402.
 Kennedy, R., 607.
 Kennerly, A. B., 433.
 Kenny, I. J., 60.
 Kent, G. C., 228.
 Kent, N. L., 198, 748.
 Kenworthy, A. L., 62, 372, 378.
 Kercher, L. C., 588.
 Kernkamp, M. F., 811.
 Kerns, K. R., 779.
 Kerr, T. W., Jr., 90, 94.
 Kerr, W. R., 113.
 Kersten, H., 358.
 Kertesz, Z. I., 329, 451.
 Kessel, J. E., 766.
 Kevorkian, A. G., 617, 666, 679, 680.
 Keyes, M. G., 186, 770.
 Khan, A. Rahman, 93.
 Khazaradze, E. P., 529.

- Kheswalla, K. F., 232.
 Kibler, H. H., 103, 265.
 Kilbrick, E. A., 362, 503, 655.
 Kidd, F., 673.
 Kidder, R. W., 788, 833.
 Kiefer, P. J., 22.
 Klenholz, J. R., 377.
 Kles, M. W., 167.
 Klesselbach, T. A., 370, 662.
 Klightinger, C. V., 806.
 Kik, M. C., 303.
 Kilby, M., 338.
 Killand, T. K., 676.
 Killinger, G. B., 366.
 Kimball, W. P., 184.
 Kimbrough, W. D., 796.
 Kinney, J. W., 66.
 Kimura, K., 813.
 Kinard, J. D., 287.
 Kincaid, J. S., 278.
 Kincaid, R. K., 791, 806.
 Kinder, F., 709, 880.
 King, A. J., 442.
 King, B. M., 52, 213, 666.
 King, C. G., 15.
 King, F. B., 104.
 King, F. G., 697.
 King, H. D., 497.
 King, J. J., 739.
 King, M. E., 541.
 King, R., 697.
 King, R. H., 466.
 King, W., 545.
 King, W. A., 98, 410.
 Kingman, H. E., 496.
 Kingman, H. E., Jr., 496.
 Kinnear, E. R., 429.
 Kinsley, C. H., 247.
 Kirk, W. G., 98, 257, 788, 833.
 Kirkham, D., 634.
 Kirkpatrick, C. M., 694.
 Kirkpatrick, H. C., 679.
 Kirkpatrick, H. F. W., 481.
 Kirsch, E. J., 725.
 Kirschbaum, A., 655.
 Kiser, O. M., 210.
 Kittell, T., 194.
 Kivlin, V. E., 612.
 Klages, K. H. W., 631, 659, 679.
 Kleckner, A. L., 567.
 Kleiber, M., 413, 657, 839.
 Klein, A. K., 330.
 Klein, H., 311.
 Klein, S., 156.
 Kleinsmith, A. W., 616.
 Klemme, A. W., 189.
 Klugler, I. J., 721.
 Klugman, A. M., 644.
 Kline, O. L., 330.
 Kling, W., 60.
 Klingman, D. L., 468.
 Klostermeyer, E. C., 399.
 Klotz, L. J., 81, 241, 542, 548, 817.
 Klug, H. P., 170.
 Knandel, H. C., 260, 838.
 Knapp, B., Jr., 98, 300, 556.
 Knaysl, G., 32, 35, 349.
 Kneen, E., 472, 489.
 Kniaginichev, M. I., 489.
 Knight, C. A., 77, 384, 385.
 Knight, H. G., 469, 470.
 Knight, H. L., 755.
 Knight, R. E., 631, 659.
 Knippling, E. F., 255.
 Knoblauch, H. C., 638.
 Knoche, W., 631.
 Knott, E. M., 596.
 Knott, J. C., 265, 343, 411, 428, 640, 843.
 Knott, J. E., 60.
 Knowlton, G. F., 247, 308, 548, 606.
 Knox, J. A. C., 51.
 Knox, J. H., 109.
 Knudson, H. W., 171.
 Knudson, L., 32.
 Koch, L. W., 236.
 Kochakian, C. D., 883.
 Kocher, H., 310.
 Kochhar, B. D., 893.
 Kochler, A., 34.
 Kochler, B., 53, 383, 503, 528, 545.
 Koenig, R. A., 332, 701.
 Koenig, V. L., 50.
 Kohnke, H., 725.
 Kolachov, P. J., 34.
 Koller, P. C., 363.
 Kollmorgen, W. M., 301.
 Kolmer, J. A., 504.
 Kolodny, L., 638.
 Komorov, A., 275.
 Kon, S. K., 142, 301.
 Koonce, D., 214, 511.
 Korikos, S., 31, 647.
 Korsmeier, R. B., 403.
 Korstian, C. F., 95.
 Korzenovsky, M., 34.
 Koser, S. A., 109.
 Kotok, E. I., 755.
 Koutz, F. R., 109.
 Kovash, A. J., 877.
 Kove, S., 461.
 Kozlik, A., 283, 583.
 Kramer, M., 75, 77, 236, 535, 894.
 Kraucoveld, E. C., 427.
 Kranick, F. G., 865.
 Krantz, B. A., 466, 659.
 Krapf, F., 222.
 Kraus, J. E., 659, 664, 679, 729.
 Krause, M. E., 457.
 Krauss, W. E., 306.
 Kraybill, H. R., 176, 344, 370, 616.
 Kreizinger, E. J., 367.
 Kremer, J. C., 18.
 Kreutzer, W. A., 66, 81, 238, 686, 691.
 Krishesky, B., 501.
 Krider, J. L., 99, 101.
 Krishna Ayyar, P. N., 400.
 Krishnaswami, N., 236.
 Křiženecký, J., 405.
 Kroeber, J. K., 543.
 Krone, P., 803.
 Krotkov, G., 61.
 Krukovsky, V. N., 4, 104, 411, 707.
 Krull, W. H., 272.
 Kruse, A. H., 484.
 Kruse, H. D., 742, 743, 744.
 Krusekopf, H. H., 22.
 Kubota, T., 490.
 Kucinski, K. J., 769, 792, 800.
 Kuenzel, J. G., 526.
 Kueher, C. A., 624.
 Kuhlman, A. H., 410, 704, 844.
 Kulp, M. R., 725.
 Kumar, I. S. S., 495.
 Kumlén, W. F., 444.
 Kummer, A. P., 52.
 Kumerth, B. L., 452.
 Kunin, R., 334.
 Kunkel, D. R., 184.
 Kunkel, L. O., 83, 241.
 Kupperman, H. S., 790.
 Kurssanov, A. L., 471.
 Kurtz, L. T., 331.
 Kuvshinova, O. P., 37.
 Kykendall, R., 26, 52, 660, 774.
 Kuyper, A. C., 177.
 Kuznets, G. M., 442, 876.
 Kylesam, M. S., 401.
 Kyrk, H., 159.
 Kyzzer, E. D., 366, 403.
 Lanke, E. W., 247.
 Lacey, J. J., 259.
 Lachman, W. H., 59, 800.
 Lacroix, D. S., 822.
 Ladd, C. E., 159.
 Ladejinsky, W. I., 285, 435.
 Lafferty, J. E. H., 283.
 LaForge, F. B., 830.
 Lagasse, F. S., 799.
 La Grange, W. P., 97.
 LaHue, D. W., 694.
 Laing, R. M., 36.
 LaMaster, J. P., 411.
 Lamb, E. H., 728.
 Lamb, L. W., 104.
 Lambert, R., 305.
 Lambert, W. F., 755.
 Lamborn, R. E., 574.
 Lambrecht, G. H., 133, 134, 441, 868.
 Lammerts, W. E., 519.
 Lamoreux, W. F., 47, 49, 364.
 Lampen, J. O., 624.
 Lampman, C. E., 616, 697, 709.
 Landauer, W., 789.

- Landerkin, G. B., 38.
 Landis, B. J., 393.
 Landis, P. H., 878.
 Landquist, V., 468.
 Landy, M., 703.
 Lane, A., 17.
 Lane, C. B., 263.
 Lane, M. C., 393, 604.
 Lanford, C. S., 143.
 Lang, A., 41.
 Lang, A. L., 53, 482, 503.
 Lang, R., 794.
 Langdon, R. F., 807.
 Langford, G. S., 830, 831.
 Langford, M. H., 44, 387.
 Langham, D. G., 40, 44.
 Langham, R. F., 712.
 Langham, W., 98, 100.
 Lantz, H. L., 220.
 Laqueur, G. L., 658.
 Lardy, H. A., 209, 555.
 Larmour, R. K., 450.
 Larose, P., 464.
 Larsen, H. C., 438.
 Larsen, L. F., 573.
 Larson, A. L., 730.
 Larson, C. A., 343, 367, 408.
 Larson, G. H., 121.
 Larson, J. E., 466.
 Larson, N. G., 436.
 Larson, N. P., 546, 695.
 Larson, O. F., 435.
 Larson, R. E., 653.
 Larson, R. H., 528.
 Larzelere, H. E., 734.
 Lasher, E. A., 335.
 Laskowski, M., 720.
 Lasley, J. F., 47, 209, 500.
 Latham, D. H., 378.
 Lathrop, F. H., 248, 828.
 Latimer, H. B., 50, 655.
 Latimer, L. P., 671.
 Latimer, R. G., 129.
 Latta, J. S., 655.
 Laudermilk, J. D., 336.
 Laufer, S., 330.
 Laurens, H., 768.
 Laurie, A., 203, 226, 523.
 La Voi, D. H., 98.
 Lavyghina, K. S., 37.
 Law, A. G., 367.
 Lawless, W. W., 799.
 Lawrence, C. A., 421, 504.
 Lawrenz, M., 143, 454.
 Laws, C. L., 603.
 Lay, D. W., 544.
 Leach, J. G., 236, 548, 680.
 Leanord, S., 17.
 Lease, E. J., 371, 403, 411, 455, 559, 892.
 Lease, J. G., 892.
 Leatham, J. H., 502, 655.
 LeBeau, F. J., 256.
 Lebedeff, G. A., 213, 405.
 LeBlanc, F. J., 564.
 LeClerc, E. L., 685.
 Ledingham, G. A., 85.
 Lee, A., 322, 755.
 Lee, A. M., 851.
 Lee, C. D., 209, 256, 270, 275, 571, 719.
 Lee, E. J., Jr., 467.
 Lee, H. M., 502.
 Lee, H. N., 157.
 Lee, J. G., 145, 410.
 Lee, O. C., 725.
 Lee, R. C., 407.
 Lee, S. B., 83.
 Leece, C. W., 236.
 Leech, W. D., 778.
 Leeder, J. G., 563.
 Leeper, G. W., 232.
 Leggatt, C. W., 512.
 Lehman, S. G., 66.
 Lehmann, E. W., 504, 573.
 Lehmann, H., 356.
 Lehr, J. J., 20, 642.
 Leighton, A., 108.
 Lelper, J. W. G., 423.
 Leith, B. D., 505.
 Leith, W. G., 295.
 Lemmon, P. E., 367, 372.
 Lemons, H., 631, 766.
 Lenarz, C., 419.
 Lenz, A. T., 632.
 Leonard, C. S., 826.
 Leonard, O. A., 27, 144, 216, 376, 660.
 Leonard, S. L., 266.
 Leonard, W. H., 662, 786.
 Leonian, L. H., 33, 614.
 Leopold, L. B., 187.
 Lepage, H. S., 236.
 Lepard, O. L., 208, 410.
 Lepkovsky, S., 457.
 Lerner, A., 177.
 Lerner, H. H., 313.
 Lerner, I. M., 260.
 LeRosen, A. L., 200.
 Leukel, R. W., 66.
 Leukel, W. A., 791.
 Leukhardt, J. C., 609.
 Levert, P., 402.
 Leverton, R. M., 592, 746, 747.
 Levi, W. M., 562.
 Levine, A. S., 34, 760, 761, 820.
 Levine, M., 34.
 Levine, N. D., 117, 274, 277, 564.
 Levine, R., 454.
 Levy, M., 171.
 Levy, S. R., 311.
 Lewis, A. A., 103, 265, 266, 845.
 Lewis, C. M., 42, 485.
 Lewis, F. H., 67, 540.
 Lewis, H. B., 454.
 Lewis, J. C., 491.
 Lewis, M. T., 513.
 Lewis, N. G., 612.
 Lewis, R. D., 369.
 Lewis, W. H., 650.
 L'Hote, H. J., 732.
 Li, C. H., 106, 501.
 Li, P. K., 315.
 Lichtstein, H. C., 179.
 Liebig, G. F., Jr., 643.
 Liebig, J. von, 616.
 Ligett, W. B., 173.
 Light, R. F., 595.
 Lightfoot, C. C., 412.
 Lightle, P. C., 243.
 Lillevik, H. A., 179.
 Lillie, R. D., 629.
 Lilly, J., 546.
 Lilly, V. G., 33, 644.
 Lin, K.-H., 80.
 Lin, S., 248.
 Lincoln, C. G., 90, 826, 832.
 Lincoln, R. E., 659, 668, 690.
 Lindegren, C. C., 208.
 Lindegren, G., 208.
 Lindenmayer, J. E., 119.
 Lindgren, D. L., 674.
 Lindgren, R. M., 84.
 Lindquist, H. G., 842.
 Lindsey, A. H., 866.
 Lindstrom, D. E., 583, 587.
 Lindstrom, E. W., 191, 206, 208, 209, 214, 228, 653.
 Linduska, J. P., 544.
 Linford, M. B., 637, 819.
 Link, C. B., 31, 803.
 Link, K. P., 167, 528, 698.
 Linn, H. D., 512.
 Linn, M. B., 79, 82, 529.
 Linsley, E. G., 89, 549.
 Linville, F. A., 582, 583.
 Lipkind, M. K., 145.
 Lipman, C. B., 191.
 Lipmann, P., 471.
 Lipschütz, A., 51.
 Lipsius, S. T., 12.
 List, G. M., 686.
 Litchfield, J. T., Jr., 859.
 Littell, M. L., 370.
 Little, T. M., 676.
 Little, V. A., 249.
 Littlefield, E. W., 678
 Liu, S. H., 154.
 Liu, T. C., 466, 900.
 Live, I., 710.
 Livermore, J. R., 53.
 Livingston, B. E., 616.
 Livingston, J. E., 67, 532.
 Lizer y Trelles, C. A., 546.
 Llewellyn Jones, J. R. J., 90.
 Lloyd, J. R., 768.
 Lloyd, J. W., 514, 584.
 Lloyd, M. G., 608.
 Lloyd, O. G., 287, 730.
 Lochhead, A. G., 33, 487.
 Lochte, H. L., 171.
 Loconti, J. D., 329.
 Loegering, W. Q., 688.
 Loehwing, W. F., 191.
 Loh, G. L., 307.

- Lohman, M. L., 881.
 Long, C. N. H., 790, 838.
 Long, D. D., 64.
 Long, E. M., 32.
 Long, F. L., 485.
 Long, H. F., 269.
 Long, T. E., 126.
 Longacre, D. J., 360.
 Longenecker, H. E., 454.
 Longwell, J. H., 273, 554, 700, 788.
 Lonnquist, J. H., 663.
 Loofbouroow, J. R., 204, 020.
 Loomis, H. F., 802.
 Loomis, W. E., 182, 183, 191, 212, 228, 649, 781.
 Loos, C. A., 300, 543.
 Loosanoff, V. L., 644.
 Loosli, J. K., 85.
 López, A. R., 229.
 Lorenz, A. J., 482.
 Lorenz, O. A., 58.
 Loring, H. S., 237.
 Lott, H. V., 289.
 Lotze, J. C., 272, 18.
 Loucks, K. W., 806.
 Loughnane, J. B., 399, 534.
 Louis, L., 144.
 Love, H. II., 53.
 Love, H. T., 617.
 Love, J. E., 366.
 Love, W. G., 272.
 Low, J. B., 86, 246.
 Lowater, F., 747.
 Lowe, B., 222, 256, 303, 881, 885.
 Lowry, S. J., 507.
 Lubberts, D., 228.
 Lubitz, J., 761, 820.
 Lucas, B. F., 610.
 Lucas, H., 103.
 Lucas, R. E., 659.
 Luce, W. A., 278.
 Lucas, Z., 777.
 Luck, J. M., 168.
 Lucker, J. T., 274.
 Ludwick, T. M., 706.
 Luebke, B. II., 290, 294.
 Luetkemeier, O. W., 466.
 Luginbill, P., 694.
 Luke, W. J., 75.
 Lukovnikov, E. K., 783.
 Lund, J. T., 435.
 Lundquist, N. S., 705.
 Lundquist, R. B., 482.
 Lundy, G., 438.
 Lundy, H. W., 717.
 Lunn, W. M., 76.
 Lunt, H. A., 160, 575.
 Luria, S. E., 643.
 Lush, J. L., 209, 263, 264, 495, 656.
 Lush, R. H., 98.
 Luthra, J. C., 282.
 Lutman, B. F., 236.
 Luttermoser, G. W., 263.
 Lutz, E. A., 130.
 Lyle, C., 695.
 Lyle, E. W., 244, 377, 680, 692.
 Lyle, J. A., 60.
 Lyle, S. P., 427.
 Lyman, J. F., 148.
 Lynch, S. J., 328, 799.
 Lyness, W. E., 370.
 Lyon, C. J., 781.
 Lyons, C., 271.
 Lyons, J., 849.
 Lyons, M. E., 605.
 Lyons, W. J., 204.
 Lyons, W. R., 106, 266, 655.
 Lysenko, T. D., 206.
 Ma, R., 350.
 Macartney, E. L., 365.
 MacClement, W. D., 69.
 MacCreary, D., 227, 245, 393.
 MacDonald, A. D., 724.
 MacDonald, G. B., 183, 226, 228.
 MacGillivray, J. II., 59, 580.
 MacGregor, R. G. S., 307.
 Machacek, J. E., 532, 684.
 MacHaffie, L. P., 397.
 Machinney, G., 41.
 Machmer, J. II., 389.
 MacIntire, W. II., 330, 343, 345.
 Mack, G. L., 165, 323, 815.
 Mack, M. J., 841, 812.
 Mack, P. B., 607, 884.
 Mack, W. B., 26, 447, 884.
 Mackey, A. K., 98.
 Mackie, D. B., 548.
 Mackinney, G., 4.
 Mackintosh, D. L., 98, 305, 467.
 MacLeod, A., 582.
 MacLeod, D. J., 251.
 MacLeod, F. L., 446.
 MacLeod, G. F., 401.
 MacMasters, M. M., 885.
 MacMillan, H. G., 538.
 Macon, J. W., 804.
 MacQuigg, C. E., 574.
 MacSwain, J. W., 549.
 MacVicar, R., 505.
 Macy, H., 741.
 Madden, A. H., 394.
 Madsen, L. L., 98, 100, 412.
 Magness, J. R., 374, 516.
 Magraw, D. A., 331.
 Mahler, J., 501.
 Mahoney, C. H., 58, 669.
 Mai, R. E., 586.
 Mai, W., 67.
 Mains, E. B., 205, 388.
 Maisonet, J., 284, 294, 440.
 Malan, P., 778.
 Malcolm, D. H., 580.
 Maldonado, J. F., 112, 270.
 Mallmann, W. L., 192, 258, 268, 715, 882.
 Malloch, W. S., 653.
 Mallon, M. G., 142.
 Malone, J. P., 533.
 Malzahn, R. C., 413.
 Mandelbaum, J., 599.
 Maneval, W. E., 630.
 Maney, T. J., 220, 523, 673, 767.
 Mangrum, J. F., 553.
 Manhart, V. C., 704, 730.
 Manis, H. C., 694.
 Manly, M. L., 311.
 Mann, L. K., 331.
 Manns, T. F., 227, 816.
 Mansjoer, M., 427.
 Mansour Ali Haseeb, 115.
 Manwaring, W. H., 312.
 Mapson, L. W., 481.
 Maravalbas, N., 381.
 Marchionatto, J. B., 238, 534.
 Marchmont-Robinson, S. W., 318.
 Marcovitch, S., 87, 303, 822.
 Margolf, P. H., 554.
 Marie-Victorin, 30.
 Marin, A. G., 89.
 Marquardt, J. C., 270, 709, 850.
 Marerro, F., 165, 213.
 Marriott, L. F., 482.
 Marsh, A. G., 746, 747.
 Marsh, G., 169.
 Marsh, G. L., 20.
 Marsh, R. L., 6.
 Marsh, R. P., 197.
 Marshak, A., 814.
 Marshall, C. E., 22, 769.
 Marshall, E. K., Jr., 419, 859.
 Marshall, F. H. A., 498.
 Marshall, G. E., 694.
 Marshall, J. II., 285.
 Marshall, M. E., 883.
 Marshall, R. P., 79, 803.
 Marsland, D. A., 650.
 Marston, A. R., 215.
 Martin, E., 900.
 Martin, E. V., 485.
 Martin, G. J., 600.
 Martin, II., 153.
 Martin, J. II., 655, 725.
 Martin, J. N., 191, 212, 228.
 Martin, J. P., 25, 28, 218.
 Martin, J. T., 826.
 Martin, W. E., 521.
 Martin, Wallace Hope, 865.
 Martin, Willard Hungate, 269, 415, 465.
 Martin, W. P., 771.
 Martineau, B. S., 795.
 Martineau, B., 395.
 Martorell, L. F., 248.
 Marts, A. C., 884.
 Marudarajan, D., 81.
 Marvin, H. N., 51, 655.

- Marx, W., 404, 655, 834.
 Mason, H. L., 480.
 Mason, I. C., 220.
 Mason, J. E., 300.
 Mason, J. H., 851.
 Massee, A. M., 252, 309, 400.
 Massey, A. B., 536.
 Massey, L. M., 67, 548.
 Massey, W., 900.
 Massey, Z. A., 836.
 Masure, M. O., 374.
 Mathews, F. P., 565.
 Matson, H., 861.
 Matsumoto, T., 83.
 Matthews, C. A., 705, 844.
 Matthews, F. D., 770.
 Matthews, M. T., 301, 445.
 Matthews, O. V., 677.
 Mattice, W. A., 22.
 Mattill, H. A., 593.
 Mattson, F., 844.
 Mattson, H., 222, 669.
 Mauldin, M. P., 32.
 Maurer, F. D., 718.
 Mavis, F. T., 631.
 Maw, A. J. G., 209, 256, 270.
 Maw, W. A., 261, 703.
 Maxwell, L. R., 39.
 May, C., 92, 381.
 May, P. G., 124.
 Mayer, A., 780.
 Mayer, D. T., 47, 210.
 Mayer, E. L., 397.
 Mayer, I. D., 697, 725.
 Mayer, L. S., 367.
 Mayernik, J. J., 638.
 Mayerson, H. S., 768.
 Mayhew, R. L., 422.
 Maynard, L. A., 97, 99, 103, 407.
 Mayton, E. L., 660.
 Maze, W. J., 280.
 McAdory, I. S., 271.
 McAllister, E. D., 784.
 McAllister, L. C., Jr., 96.
 McAllister, J., 34.
 McAtee, W. L., 86.
 McBride, C. G., 582.
 McCalla, T. M., 630, 773.
 McCalmont, J. R., 580.
 McCampbell, C. W., 98.
 McCance, R. A., 748.
 McCarty, D. E., 442.
 McCarty, E. C., 505.
 McCarty, M. A., 98, 557.
 McCarty, R. G., 103.
 McCauley, W. E., 124, 545.
 McCay, C. M., 85, 99, 101, 103.
 McCesney, E. W., 310.
 McClean, A. P. D., 76.
 McClellan, G., 382.
 McClellan, W. D., 380.
 McClelland, C. K., 664.
 McClelland, J. B., 302.
 McClendon, J. F., 178.
 McClendon, J. W., 660.
 McCleskey, C. S., 83, 848.
 McClure, F. A., 777.
 McClure, F. J., 890.
 McClure, H. E., 262, 391.
 McClure, J. T., 482.
 McCollum, E. V., 149, 315, 507.
 McCollum, J. P., 514.
 McComb, A. L., 66, 226.
 McCormick, D. R., 468.
 McCormick, E., 277.
 McCormick, F. A., 388.
 McCoy, E., 118, 776.
 McCoy, E. E., 392.
 McCoy, E. E., Jr., 392.
 McCoy, J. E., 421.
 McCrory, S. A., 513.
 McCubbin, E. N., 791, 799.
 McCubbin, W. A., 96.
 McCulloch, E. C., 418, 421, 719.
 McCulloch, L., 692.
 McCullough, H., 37.
 McCune, D. J., 312.
 McDaniel, A., 370.
 McDonald, C. W., 98.
 McDonald, E. J., 175.
 McDonald, H. G., 404, 418.
 McDonald, I. W., 570.
 McDonald, W. F., 482, 632.
 McDougale, H. C., 108.
 McDowall, F. H., 844.
 McFadden, E. S., 280.
 McFarlane, J. S., 505.
 McFarlane, V. H., 193.
 McGeorge, W. T., 330, 635.
 McGinnis, J., 99.
 McGoldrick, F., 53.
 McGovran, E. R., 397, 547.
 McGuffin, W. C., 400.
 McGugan, A. C., 852.
 McGuire, E., 158.
 McGuire, H. S., 610.
 McGuire, J. R., 526.
 McIlargue, J. S., 330, 347.
 McHenry, E. W., 146, 454.
 McHenry, J. T., 274.
 McIlvanie, S. K., 487.
 McIndoo, N. E., 821.
 McInnes, J. W., 462.
 McIntire, F. C., 681.
 McIntire, J. M., 150, 893.
 McIntosh, J. A., 278, 404, 447, 751, 882.
 McIntyre, C. N., 801.
 McIntyre, C. W., 47, 52.
 McIntyre, G., 264.
 McIntyre, H. L., 549, 829.
 McKaig, N., Jr., 342, 367.
 McKay, A. W., 440.
 McKay, H., 452, 592.
 McKay, H. H., 31.
 McKay, J. W., 31, 653.
 McKay, R., 75.
 McKee, R., 869.
 McKelvey, J. J., 400.
 McKenzie, F. F., 47, 209, 823, 500.
 McKenzie, M. A., 390, 806.
 McKercher, D. G., 498.
 McKibben, E. G., 277, 467, 611.
 McKibbin, J. M., 310, 558, 570.
 McKinney, H. H., 69, 208, 231, 384, 503.
 McKittrick, E. J., 880.
 McLaughlin, F. A., 370.
 McLaughlin, J. H., 74.
 McLean, J. G., 66, 665, 686.
 McLean, L. G., 468.
 McLean, R. C., 191.
 McLean, W., 404.
 McMichael, S. C., 359.
 McMillan, R. T., 737, 867.
 McMillen, W. N., 98, 100.
 McMiller, P. R., 184.
 McMunn, R. L., 516.
 McNair, J. B., 68.
 McNally, E. H., 50.
 McNeil, E., 426, 858.
 McNeill, J. M., 288.
 McNew, G. L., 222, 539.
 McNutt, P. V., 314.
 McNutt, S. H., 212, 256, 568, 713.
 McPeck, M., 442.
 McPheters, W. H., 187.
 McShan, W. H., 700.
 McSpadden, B. J., 360, 404, 701.
 McVeigh, I., 83.
 McVey, W. C., 336.
 McVey, W. M., 655.
 McVickar, M. H., 346.
 McWhirter, L., 887.
 McWhorter, D. C., 730.
 McWhorter, F. P., 238.
 Mead, S. W., 413.
 Meadows, S. B., 685.
 Meahl, R. P., 513, 676.
 Meanley, B., 391.
 Means, R. H., 405.
 Mecchi, E., 838.
 Medawar, P. B., 629.
 Meder, L. C., 121.
 Medler, J. T., 821.
 Mehlich, A., 642.
 Mehlig, J. P., 171.
 Mehrhof, N. R., 787, 833.
 Meier, W., 247.
 Melklejohn, E. P., 620.
 Melklejohn, G. T., 623.
 Meiller, E. J., 592.
 Melchers, G., 41.
 Melchers, L. E., 527, 811, 812.
 Meldrum, G., 301.
 Meldrum, H. R., 183, 212, 214, 283.
 Melhus, I. E., 79, 191, 212, 227, 228.

- Mellish, C. H., 790.
 Mellon, M. G., 173.
 Melnick, D., 149, 622.
 Meloche, V. W., 171.
 Melville, D. B., 624, 625.
 Melville, J., 492.
 Mendall, S. C., 822.
 Méndez, F., 213.
 Menefee, E. R., 729, 730.
 Mentzer, R. L., 245.
 Menzies, J. D., 378.
 Merchant, C. H., 220.
 Meredith, C. H., 70.
 Merkle, F. G., 482, 513.
 Merrill, M. C., 159.
 Merrill, R. M., 279.
 Merwe, C. van der, 139.
 Metcalf, H. E., 900.
 Metzger, C. H., 535.
 Metzger, W. H., 485, 900.
 Meuleman, W. L., 105.
 Meyer, A., 666.
 Meyer, B. S., 43.
 Meyer, C. E., 315.
 Meyer, K., 33.
 Meyer, K. H., 650.
 Meyer, R. K., 51, 655.
 Meyerhof, O., 454.
 Meyers, F. M., 456.
 Michelbacher, A. E., 89.
 Michener, C. D., 89.
 Mickel, C. E., 402.
 Mickey, G. H., 358, 628.
 Mickle, F. L., 107.
 Middleton, J. T., 67, 388, 805, 817.
 Midgley, A. R., 638, 660.
 Midgley, M. C., 333.
 Mielke, J. L., 66.
 Mighell, R. L., 286, 582.
 Milam, D. F., 152.
 Milanez, F. R., 234.
 Milas, N. A., 15.
 Milbrath, J. A., 381, 388, 523, 816.
 Milby, T. T., 562.
 Miles, C. B., 166.
 Miles, H. W., 253.
 Miles, S. R., 659.
 Milhorat, A. T., 307.
 Milk, R. G., 286, 444.
 Milks, H. J., 564.
 Millar, C. E., 182.
 Millás, J. C., 181.
 Millen, T. W., 212.
 Millenky, A., 104.
 Miller, B. S., 489.
 Miller, C. D., 144.
 Miller, D., 262, 561, 840.
 Miller, E., 741.
 Miller, E. E., 585.
 Miller, E. J., 168, 169.
 Miller, E. S., 167.
 Miller, F., 134.
 Miller, G. L., 77.
 Miller, H., 345.
 Miller, H. J., 528.
 Miller, H. W., 372.
 Miller, J. C., 97, 98.
 Miller, J. H., 539.
 Miller, J. I., 99.
 Miller, J. P., 86.
 Miller, K. W., 292.
 Miller, L. B., 482.
 Miller, L. C., 330.
 Miller, L. I., 67, 534.
 Miller, M. F., 22, 775.
 Miller, M. R., 662.
 Miller, M. W., 555.
 Miller, O. N., 839.
 Miller, P. A., 387.
 Miller, P. G., 411.
 Miller, P. W., 242, 388.
 Miller, R. C., 98, 557, 836.
 Miller, R. L., 545.
 Miller, V. L., 343, 610, 813.
 Milligan, O. D., 740, 754.
 Millikan, C. R., 810.
 Milliron, H. E., 467.
 Mills, C. A., 602.
 Mills, E. M., 544.
 Mills, P. J., 75.
 Mills, R., 889.
 Mills, R. C., 409, 839.
 Mills, W. D., 67, 540.
 Milne, R. A., 26.
 Milner, H. W., 485.
 Milsom, D., 257.
 Milthorpe, F. L., 529.
 Minarik, C. E., 195, 468.
 Minckler, L. S., 525.
 Miner, F. D., 900.
 Minert, K. R., 417.
 Minett, F. C., 713.
 Minges, P. A., 212, 673.
 Minneman, P. G., 284.
 Minnum, E. C., 39, 58.
 Misner, E. G., 104, 129.
 Mitchell, D., 445.
 Mitchell, H. H., 143, 403, 454, 555, 564.
 Mitchell, H. S., 306, 314, 450, 709, 880.
 Mitchell, J. H., 30, 371, 403, 411, 455, 559.
 Mitchell, J. H., Jr., 176, 616.
 Mitchell, J. W., 62, 654.
 Mitchell, L. C., 330.
 Mitchell, R. L., 570.
 Mitra, K., 589.
 Mittra, H. C., 589.
 Mix, A. E., 330.
 Mixner, J. P., 266, 845.
 Mizell, L. R., 157.
 Moberg, T. R., 900.
 Modess, O., 777.
 Moetsch, J. C., 853.
 Moffett, H. C., 98.
 Molenaar, A., 279.
 Molestina, O. E., 755.
 Molinary Salés, E., 213, 221.
 Money, W. L., 654.
 Monlux, W. S., 567.
 Monosmith, R. O., 58.
 Monroe, D., 136, 158, 159, 321, 608, 897.
 Monroe, M. M., 322.
 Monson, O. W., 431.
 Montonna, R. E., 176.
 Moody, J. E., 636.
 Moers, C. A., 465.
 Moore, B. H., 210.
 Moore, C. R., 900.
 Moore, D. C., 522.
 Moore, E. L., 491, 761.
 Moore, E. N., 715.
 Moore, J. D., 528.
 Moore, J. S., 704.
 Moore, L. A., 763.
 Moore, M. B., 821.
 Moore, M. H., 395.
 Moore, O. K., 658.
 Moore, P. R., 892.
 Moore, R. C., 150.
 Moore, R. E., 277, 771.
 Moore, R. H., 617.
 Moore, R. P., 31.
 Moore, S., 167.
 Moore, T., 891.
 Moore, W., 821.
 Moore, W. A., 179.
 Moore, W. D., 239, 386.
 Moorman, R. B. B., 576.
 Moragues, V., 565.
 Morales, J. O., 284.
 Moraw, H. O., 330.
 Morehead, H. A., 123.
 Moreland, C. F., 31, 651.
 Morell, S. A., 15, 175.
 Moreno, R., 858.
 Morey, H. F., 632.
 Morgall, P. W., 168, 169.
 Morgan, A. F., 137.
 Morgan, B., 302.
 Morgan, B. B., 392, 568.
 Morgan, C. L., 403, 559.
 Morgan, I. M., 566, 717.
 Morgan, M. E., 106, 847.
 Morgan, M. F., 26, 160, 768, 790, 774, 803.
 Morgan, W. L., 240.
 Moriguchi, S., 218.
 Morine, H. S., Jr., 287, 730.
 Morison, F. L., 584, 868.
 Morrell, E., 404.
 Morrill, A. W. Jr., 248, 822.
 Morrill, C. C., 274.
 Morrill, D. R., 116, 854.
 Morris, C. S., 847.
 Morris, H. E., 377, 536, 812.
 Morris, L. L., 58.
 Morris, M. L., 117.
 Morris, O. M., 372.
 Morris, P. G. D., 857.
 Morrison, B. V., 608.
 Morrison, F. B., 99, 103.
 Morrison, H. E., 391.
 Morrison, R. W., 415.

- Morrow, E. B., 520.
 Morse, R. E., 761.
 Morse, R. W., 842.
 Mortensen, M., 284.
 Mortlock, H. C., 25.
 Morton, M., 370.
 Moseley, E. L., 852.
 Moseley, L. E., 737.
 Moser, A. M., 308, 451, 455.
 Moser, F., 366, 772.
 Moser, H. C., 504.
 Moses, B. D., 278.
 Moses, C. S., 528.
 Moses, H. E., 114.
 Mosher, M. L., 583.
 Mosher, P., 261.
 Moshkov, B. S., 784.
 Mosley, V. M., 39.
 Moss, A. E., 545.
 Moss, C., 707.
 Moss, W. A., 631, 650.
 Motheral, J. R., 287.
 Mott, F. E., 104.
 Mott, G. O., 659, 704.
 Mott, L. O., 718.
 Mott, P. B., 75.
 Motts, G. N., 874.
 Motz, F. A., 735, 736.
 Moulton, F. R., 616.
 Mowry, H., 791.
 Moxon, A. L., 98, 332, 397, 421, 424, 554, 564, 565, 643.
 Moyer, L. S., 203, 649.
 Mrak, E. M., 17, 339, 522.
 Muckenbirt, R., 504.
 Mueller, C. D., 47, 363.
 Mueller, W. S., 417, 709, 760, 842, 880.
 Muesebeck, C. F. W., 246, 403.
 Muhrer, M. E., 361.
 Muir, G. W., 257.
 Mules, M. W., 96.
 Mulhern, T. D., 551.
 Mulholland, J. J., 817.
 Mullen, L. A., 367.
 Müller, A. S., 229.
 Muller, C. H., 32, 770.
 Müller, R. H., 474.
 Mullin, J. R., 548.
 Mulloy, G. A., 65.
 Mulvey, R. R., 659.
 Mumford, D. C., 878.
 Mumford, F. B., 159.
 Mumm, W. J., 503.
 Muncie, J. H., 19.
 Mundinger, F. G., 520.
 Munger, F., 250.
 Munger, H. M., 57.
 Muñoz, C. M., 858.
 Munn, M. T., 513, 798.
 Munro, J. A., 95, 391, 695, 832.
 Munsell, H. E., 312.
 Munson, S. C., 253, 397.
 Murer, H. K., 640.
 Murlin, J. R., 308, 883, 884.
 Mursack, A. E., 4, 32, 57, 670.
 Murphey, C. E., 98.
 Murphree, R. L., 209.
 Murphy, A., 795.
 Murphy, D., 679.
 Murphy, E., 316.
 Murphy, E. F., 151, 302, 606.
 Murphy, H. C., 212, 227, 684, 812.
 Murphy, H. F., 638, 683.
 Murphy, R. R., 102, 434, 554, 837.
 Murray, C. W., 330.
 Murray, J., 158.
 Murray, M. M., 747.
 Murray, W. G., 183, 283.
 Murrill, W. A., 487.
 Murry, C., 270.
 Musanov, V. D., 229.
 Musgrave, G. W., 632.
 Mushin, R., 244, 530.
 Musil, A. F., 370, 512.
 Muskavitch, L., 505, 513.
 Muskett, A. E., 74, 533.
 Musselman, H. H., 578, 611.
 Musser, A. M., 338.
 Musser, H. B., 125, 504.
 Muth, O. H., 116, 856.
 Myers, A. T., 33.
 Myers, C. E., 513.
 Myers, C. H., 57.
 Myers, H. E., 24, 636, 773.
 Myers, H. G., 900.
 Myers, W. I., 130.
 Nadeau, J. P., 583.
 Naffziger, L. M., 343.
 Nagayama, T., 481.
 Naghsli, J., 686.
 Nagornyi, P. I., 242, 520.
 Nagy, D., 327.
 Nair, J. H., 842.
 Najjar, V. A., 621, 750.
 Nailbandov, A., 211.
 Nance, N. W., 67, 691, 805.
 Nash, H. A., 466, 659.
 Nash, K. B., 90.
 Nash, L. B., 53, 799.
 Nayar, S. L., 86.
 Naylor, A. W., 41.
 Naylor, H. B., 776.
 Neal, D. C., 812.
 Neal, N. P., 513.
 Neal, W. M., 833.
 Neasham, E. W., 290.
 Nebel, B. R., 46, 611, 801.
 Nebel, M. R., 611.
 Neel, L. R., 367.
 Neff, J. A., 254.
 Neitz, W. O., 851.
 Neller, J. R., 768, 791, 799.
 Nelsen, O. E., 499.
 Nelson, C., 512.
 Nelson, C. E., 367.
 Nelson, E. K., 617.
 Nelson, E. M., 330, 450.
 Nelson, F. E., 269, 415.
 Nelson, J. W., 755.
 Nelson, L., 445, 483, 504.
 Nelson, M. L., 678.
 Nelson, O. A., 474.
 Nelson, P., 130, 730.
 Nelson, P. M., 222, 256, 303.
 Nelson, R., 818.
 Nelson, R. H., 209.
 Nelson, W. O., 655, 789.
 Neter, E., 710.
 Nettles, V. F., 799.
 Neubert, A. M., 327, 451, 468.
 Neufeld, C. C., 70.
 Nevens, W. B., 562.
 Newburger, S. H., 331.
 Newcomb, A. L., 888.
 Newcomer, E. J., 395.
 Newell, G. W., 725, 730.
 Newell, I. M., 393.
 Newell, L. C., 214.
 Newell, W., 899.
 Newhall, A. G., 57, 67, 78, 819.
 Newlander, J. A., 843.
 Newlin, H. E., 99.
 Newman, H. W., 451.
 Newsom, L. D., 90.
 Newton, J. H., 240, 691.
 Newton, W. H., 52.
 Nicowonger, R., 713.
 Nicholas, J. E., 102, 125, 434, 563, 865.
 Nicholls, W. D., 130, 133.
 Nicholls, W. H., 283.
 Nichols, M. L., 173, 430.
 Nichols, R. E., 106.
 Nicholson, A. J., 229.
 Nicholson, L. G., 418, 719.
 Nicholson, V. H., 129.
 Nickle, H. G., 343, 367.
 Nicol, A., 121.
 Nicol, H., 350.
 Niederhof, C. H., 182.
 Niedermeyer, R. P., 554.
 Nielsen, E., 599, 698.
 Nielsen, G. L., 270.
 Nielsen, L. W., 66.
 Nier, A. O., 166, 168, 348.
 Nightingale, G. T., 355.
 Nikiforoff, C. C., 185.
 Nikolaiczuk, N., 261, 703.
 Nikolayev, B. A., 475.
 Nilov, V. I. (Nilow, W. I.), 489.
 Nilson, H. W., 591.
 Nisbet, R., 103.
 Nisikado, Y., 813.
 Nissley, C. H., 669.
 Nitzberg, T., 603.
 Niven, C. F., Jr., 32, 109, 420.
 Nixon, M. W., 279.
 Niyogi, S. P., 589.
 Noble, C. V., 869.
 Noble, G. K., 365.
 Noble, H. R., 505.
 Noble, J. H., 98.

- Noble, M., 495.
 Nobrega, N. R., 75, 81, 285.
 Nodland, T. R., 297.
 Noggle, G. R., 52, 478.
 Noguera, J. R., 284, 870, 871.
 Nolan, L. C., 435.
 Nolan, L. S., 744.
 Nolan, M. O., 419.
 Noll, C. F., 504, 641.
 Noll, C. I., 13.
 Nolla, J. A. B., 323, 435, 465.
 Nord, F. F., 69, 192, 471.
 Nordgren, R., 9, 604.
 Normal, A. G., 193.
 Norman, A. G., 5, 183, 618, 636.
 Norman, J. D., 194.
 Norris, E. L., 612.
 Norris, F. A., 167.
 Norris, L. C., 99, 257, 409, 560.
 North, M. O., 788.
 Norton, E. M., 34.
 Norton, J. B. S., 160.
 Norton, L. B., 90.
 Norton, L. J., 582, 583.
 Notley, V. E., 751.
 Nottingham, J. O., 90.
 Novak, R., 877.
 Nugent, T. J., 67.
 Nusbaum, C. J., 371, 378.
 Nutt, G. B., 428.
 Nutter, P. E., 308.
 Nutting, H. W., 448, 880, 887.
 Nybrotten, N., 729.

 Oberholtzer, J. W., 729.
 Obregon Botero, R., 807.
 O'Brien, J. A., Jr., 784.
 Ocfemia, G. O., 69.
 O'Connor, M. G., 761.
 O'Dell, R. A., 657.
 Oderkirk, G. C., 694.
 Odland, T. E., 221.
 Oexemann, S. W., 52, 196.
 Ofelt, C. W., 328.
 Ogaard, A. T., 153.
 Ogden, W. B., 184, 218.
 Ogg, C. L., 762.
 Oglesbee, J. C., Jr., 124.
 Ohlrogge, A. J., 467, 659.
 Ohlson, M. A., 303, 592.
 Ohmer, H. B., 18, 19.
 O'Kane, D. J., 33.
 O'Kane, W. C., 547.
 O'Kelly, J. F., 213.
 Okrostsvaridze, N. A., 529.
 Olafson, P., 99, 567, 855.
 Olcott, H. S., 141.
 Oldham, F. K., 655.
 Olitsky, P. K., 566, 717.
 Olive, L. S., 807.
 Olliver, M., 589.
 Olmsted, C. E., 353.
 Olsen, M. W., 359, 426, 627, 628, 658.
 Olsen, O. W., 856.
 Olson, C., 119.
 Olson, C., Jr., 611, 721, 858.
 Olson, F. E., 466, 488, 638, 659.
 Olson, L. C., 5, 174.
 Olson, O. E., 329, 564, 565, 643.
 Olson, R. E., 90.
 Olson, R. V., 524.
 Olson, T. M., 412, 563, 564.
 O'Mara, J. G., 52, 67, 85, 359.
 O'Neill, W. J., 372, 393, 395.
 Orcutt, F. S., 33, 413.
 Orr, A. E., 158.
 Orsini, G., 539.
 Orten, A. U., 599, 600.
 Osborn, W. M., 548.
 Oser, B. L., 5, 622.
 Osmun, A. V., 806.
 Ostrolenk, M., 553.
 Otanes, F. Q., 89.
 Otero, J. I., 465, 800.
 Ott, W. H., 838.
 Outhouse, J., 588, 889.
 Overholser, E. L., 62, 139, 340, 372, 378, 516.
 Overholser, M. D., 655.
 Overholts, L. O., 644.
 Overley, F. L., 372, 378, 395, 516.
 Overman, O. R., 562.
 Overman, R. S., 698.
 Overstreet, M. R., 880.
 Overstreet, R., 645.
 Owen, C. A., 607.
 Owen, F. V., 652.
 Owens, C. E., 240, 377.
 Owrey, W. T., 96.
 Owtschinnikow, N. N., 42.

 Packchanian, A., 112.
 Paddock, F. B., 247.
 Paden, W. R., 366.
 Pady, S. M., 530.
 Page, J. B., 173.
 Page, W. G., 858.
 Painter, E. P., 836.
 Painter, H. R., 694.
 Painter, R. H., 547.
 Palilova, (U. J.) K., 489.
 Palkin, S., 477.
 Palm, C. E., 90, 826.
 Palmer, A. H., 171.
 Palmer, C. E., 311, 741, 744.
 Palmer, E. J., 776.
 Palmer, M. A., 394.
 Palmer, R. G., 67.
 Palmerton, E. S., 155.
 Palmes, E. D., 5.
 Palmiter, D. H., 67, 531, 541.
 Panshin, A. J., 679.
 Papadakis, J. S., 25.
 Pappenheimer, A. M., 896.
 Paquet, G., 395.
 Paraan, L., 107.
 Parcher, L. A., 730.
 Paris, C. D., 523.
 Parish, H. E., 255.
 Park, J. B., 783.
 Park, J. W., 440.
 Park, O. W., 247.
 Parker, A. E., 5.
 Parker, E., 648.
 Parker, E. R., 241.
 Parker, H. L., 401.
 Parker, J. E., 360, 404, 701.
 Parker, J. R., 247.
 Parker, K. G., 67.
 Parker, L. W., 872.
 Parker, M. W., 40, 357.
 Parker Rhodes, A. F., 380.
 Parkhurst, R. T., 559, 837, 838.
 Parks, H. B., 32.
 Parks, R. R., 573.
 Parr, W. J., 551.
 Parris, G. K., 242.
 Parrott, E. M., 94, 837.
 Parrott, I. M., 369.
 Parrott, P. J., 324, 402.
 Parshall, R. L., 277.
 Parson, H. E., 817.
 Parsons, C. H., 842.
 Parsons, E. D., 171.
 Parsons, F. L., 299.
 Parsons, K. H., 583.
 Partridge, N. L., 223, 767.
 Pastor Rodriguez, J., 213.
 Patch, L. H., 550.
 Patrias, G. C., 410.
 Patterson, E. K., 493.
 Patterson, G. K., 400.
 Patterson, G. W., 23.
 Patterson, J. T., 363.
 Patterson, W. I., 157.
 Pattison, I. H., 856.
 Patton, A. R., 99, 484.
 Patton, E. L., 171.
 Patton, M. B., 452, 592.
 Patty, R. L., 573.
 Patwardhan, V. N., 589.
 Patzer, W. E., 483.
 Paull, A. E., 182.
 Paulson, W. E., 132, 866.
 Pavcek, P. L., 316.
 Pavlenko (Pawlenko), O. N., 480.
 Payne, F., 50.
 Peacock, G., 10.
 Peacock, N. D., 342, 666.
 Pearce, G. W., 827.
 Pearl, R., 259.
 Pearson, F. A., 180, 283.
 Pearson, P. B., 97, 600, 893, 899.
 Pearson, R. W., 183.
 Peck, R. H., 227.
 Pederson, C. S., 17, 19, 34.
 Pederson, E. S., 655.
 Peebles, R. H., 347, 509.
 Peech, M., 768, 799.

- Peele, T. C., 342, 773.
 Peet, L. J., 322.
 Pelczar, M. J., Jr., 338.
 Peluffo, C. A., 420.
 Peluso, J. V., 338.
 Peña, R. C., 89.
 Pence, J. W., 697, 739.
 Penn, R. J., 867.
 Pennell, M. Y., 158, 897.
 Pennock, W., 668.
 Penquite, R., 561, 702.
 Pepper, B. B., 93, 695, 833.
 Perak, M., 721.
 Peres, C. E., 852.
 Péroz-Moreau, R. A., 194.
 Perkins, A. T., 331, 555.
 Perkins, W. R., 793.
 Perlmann, G. E., 166.
 Perlzweig, W. A., 601.
 Perrin, D. H., 213.
 Perry, B. A., 31.
 Perry, M., 321, 608.
 Perry, R. L., 580, 729.
 Persing, C. O., 396, 403.
 Person, L. H., 685, 810.
 Peters, H. G., 168, 169.
 Petering, B. G., 392, 423.
 Petersen, W. E., 265, 706.
 Peterson, A. G., 85.
 Peterson, A. H., 332.
 Peterson, D., 650.
 Peterson, G. R., 285.
 Peterson, J. B., 183, 333.
 Peterson, L. C., 67.
 Peterson, M. J., 287.
 Peterson, M. L., 811.
 Peterson, V. E., 103.
 Peterson, W. H., 454, 554, 624, 626, 681, 770, 876.
 Peterson, W. J., 7.
 Petri, L., 900.
 Petrov, P. A., 220.
 Pett, L. B., 145.
 Pettersson, M. L. R., 31.
 Pettus, D. M., 288.
 Pfadt, 822.
 Pfaff, H. L., 369.
 Pfaffman, G. A., 96.
 Pfeiffer, C. A., 655.
 Pfeiffer, N. E., 31.
 Pfister, L. J., 432.
 Pfund, M. C., 448.
 Pfund, M. F., 886.
 Phelps, A. S., 195.
 Philip, C. B., 402.
 Phillips, A. M., 85.
 Phillips, C. D., 875.
 Phillips, C. E., 212, 220, 393.
 Phillips, J. H. H., 687.
 Phillips, J. K., 170.
 Phillips, M., 187, 473.
 Phillips, P. H., 98, 209, 314, 410, 554, 705.
 Phillips, R. E., 364.
 Phillips, R. W., 209, 210.
 Phillips, T. G., 191.
 Phillips, W. H., 220.
 Philp, G. L., 519.
 Philp, J., 233.
 Phinney, B. O., 206.
 Philpard, E. F., 136.
 Pickels, G. W., 575.
 Pickett, B. S., 220, 372, 673.
 Pickett, G., 577.
 Pickett, W. F., 61.
 Pieper, J. J., 503.
 Pierce, M. E., 566.
 Pierpont, R. L., 245.
 Pierre, J. J., 483.
 Pierre, W. H., 182, 183, 212, 214, 663.
 Piersma, H. D., 852.
 Pierson, A. H., 227.
 Pierson, E. M., 590, 608.
 Pigott, M. G., 457.
 Pinckard, J. A., 235, 238, 381, 382, 536, 537, 649, 681.
 Pincus, G., 789.
 Pingrey, H. B., 437.
 Pinkerton, H., 565.
 Piper, C. S., 235.
 Pipkin, S. B., 363.
 Pirone, P. P., 810, 817, 818.
 Pirschle, K., 41.
 Pittman, M. S., 452, 502.
 Plagge, H. H., 220, 303, 375, 885.
 Plakidas, A. G., 389, 816.
 Plambeck, H. H., 136.
 Plank, C. J., 175.
 Plank, H. K., 605.
 Plastring, W. N., 106, 847.
 Platenius, H., 32, 58, 130, 585, 608.
 Plath, C. V., 638.
 Platt, C. S., 408.
 Pletsch, D. J., 250.
 Plummer, B. E., Jr., 228, 236, 264.
 Plunkett, O. A., 538.
 Poehlman, J. M., 52, 54, 98.
 Poffenberger, P. R., 134, 873.
 Pohle, E. M., 97, 556.
 Polrot, P. L., 129.
 Polansky, T. S., 193.
 Polderboer, E. B., 545.
 Polcy, W. E., 554, 703.
 Polgár, A., 312.
 Poling, E. B., 298.
 Polk, H. D., 128, 275, 702, 840.
 Polk, H. T., 428.
 Polk, S. J., 419.
 Pollack, H., 315, 894.
 Pollard, A. J., 129, 583.
 Pollard, H. N., 378, 393.
 Pollard, L. H., 221.
 Polson, A. L., 851.
 Polunin, N., 485, 776.
 Pomerat, G. R., 50.
 Pomerleau, R., 390.
 Pond, G. A., 297.
 Ponting, J., 17.
 Pontis, R. E., 242, 538, 817.
 Poole, A. J., 544.
 Pope, M. N., 510.
 Pope, S., 67.
 Popham, R. A., 31.
 Porges, N., 169.
 Porter, D. A., 272.
 Porter, D. R., 60.
 Porter, J. R., 338.
 Porter, O. J., 121.
 Porter, R. H., 55, 214, 228, 512.
 Porter, W. F., 213.
 Post, E. E., 336.
 Post, K., 64, 225.
 Potter, C., 87, 825.
 Potter, J. M. S., 767.
 Potter, V. R., 894.
 Potts, S. F., 549.
 Pounden, W. D., 567.
 Powell, B. B., 86.
 Powell, D. P., 184.
 Powell, H. M., 710.
 Powell, J., 304.
 Powell, P. J., 341.
 Powell, R. C., Jr., 568.
 Powers, J. J., 761.
 Powers, L., 45.
 Powers, T. C., 121.
 Powers, W. L., 197, 278.
 Powning, R. F., 565.
 Pratt, A. D., 704.
 Pratt, M. R., 608.
 Pratt, R., 32.
 Pray, E. G., 180.
 Prentice, E. P., 264.
 Presley, J. T., 377.
 Preston, J. M., 463.
 Preston, N. C., 385.
 Preston, R. D., 42.
 Price, D., 658.
 Price, F. E., 865.
 Price, R., 505.
 Price, W. A., 60, 370.
 Price, W. H., 121.
 Prickett, L. C., 578.
 Prince, A. L., 330.
 Probst, A. H., 659.
 Prouty, C. C., 278, 404, 411.
 Prucha, M. J., 562.
 Pruitt, R. S., 330.
 Pubols, B. H., 435, 436.
 Pucher, G. W., 168, 174.
 Puck, T. T., 649.
 Puhr, L. F., 483, 504, 564.
 Purdy, T. L., 258.
 Purvis, E. R., 29, 774.
 Pusateri, S. J., 31.
 Putman, W. L., 397.
 Putnam, H. O., 805.
 Pyke, M., 446.
 Pyke, W. E., 304, 884.
 Pyne, G. T., 849.
 Quaife, E. L., 209.
 Quayle, W. L., 373, 508.
 Quesenberry, J. R., 360, 556.
 Quick, A. J., 461.

- Quick, V. H., 505.
 Quin, A. H., 258.
 Quinby, J. R., 821.
 Quintus, P. E., 283.
 Quisenberry, J. H., 496.
 Quisenberry, K. S., 797.

 Rachele, J. R., 625.
 Rackemann, F. M., 566.
 Radchenko, S. I., 353.
 Rader, L. F., Jr., 330, 334.
 Raeder, J. M., 74, 659, 679, 725.
 Rangland, C. H., 221, 675.
 Ragsdale, A. C., 47, 52, 103, 265, 704.
 Rahn, E. M., 513.
 Rainboth, E. D., 159, 321.
 Rainwater, C. F., 393.
 Raistrick, H., 349.
 Raiziss, G. W., 853.
 Raleigh, G. J., 58.
 Raleigh, S. M., 197.
 Ralston, N. P., 103.
 Ramachandra Rao, T., 96, 402.
 Ramakrishnan, T. S., 70.
 Ramirez, J. H., 165, 761.
 Ramirez Silva, F. J., 213.
 Ramos, M. M., 233.
 Ramsay, M., 90.
 Ramsay, R. C., 157.
 Ramser, C. E., 632.
 Ramsey, G. B., 580.
 Ramsey, J. G., 763.
 Ramsey, R. J., 738.
 Ramstad, P. E., 54.
 Randall, P. E., 11.
 Randall, T. E., 31.
 Randle, S. B., 100.
 Randolph, L. F., 53, 206.
 Rane, E. C., 86.
 Ranganathan, S., 86.
 Rangaswami Ayyangar, G. N., 236.
 Rankin, A. D., 698.
 Rankin, W. H., 344.
 Rao, T. R., 402.
 Rapaport, H. G., 156.
 Raper, J. R., 488.
 Raper, K. B., 38.
 Rapoport, M., 607.
 Rapp, K. E., Jr., 347.
 Raptopoulos, T., 45.
 Rash, J. R. Jr., 209, 657.
 Raskopf, B. D., 289.
 Rasmussen, E. J., 815.
 Rasmussen, M. P., 129.
 Rasmussen, R. A., 259.
 Ratcliffe, H. L., 497.
 Rathmell, T. K., 476.
 Ratsek, J. C., 47.
 Rauchenstein, E., 436.
 Rawles, M. E., 655.
 Rawlins, T. E., 628.

 Rawlins, W. A., 90, 248.
 Ray, R. D., 789.
 Ray, R. G., 65.
 Ray, W. W., 74.
 Reynolds, J. A., 15.
 Readey, J. C., 389.
 Rebrassier, R. E., 109.
 Rebstock, J. D., 67.
 Record, P. R., 262, 560.
 Reddick, D., 67.
 Reddish, G. F., 396.
 Reddy, C. S., 191, 212, 228.
 Redfield, G. M., 754.
 Reece, R. P., 103, 208, 209, 266, 410.
 Reed, A. R., 428.
 Reed, G. M., 786.
 Reed, G. N., 348.
 Reed, H. J., 755.
 Reed, H. S., 30, 646, 809.
 Reed, J. M., 34.
 Reed, R. H., 545, 573.
 Reed, W. D., 823.
 Reeder, W. W., 136.
 Reeves, W. C., 711.
 Regan, D., 711.
 Reihart, E. L., 850.
 Reid, C. F., 30.
 Reid, H. D., 483.
 Reid, J. J., 33, 686.
 Reid, M. E., 351.
 Reid, M. G., 284, 321.
 Reid, T. S., 826.
 Reid, W. H. E., 103, 417.
 Reid, W. M., 571.
 Reifman, A., 309.
 Reindollar, W. F., 330.
 Reineke, E. P., 103, 267, 705.
 Reineke, L. H., 226, 526, 678.
 Reinhard, H. J., 255, 552, 553.
 Reinhardt, W. O., 404.
 Reinking, O. A., 815.
 Reinmiller, C. F., 209.
 Render, N. D., 646.
 Renne, R. R., 611.
 Rettger, L. F., 111.
 Reuss, C. F., 588, 878.
 Reuther, W., 373, 799.
 Reyes, G. M., 234.
 Reynard, G. B., 539.
 Reynolds, M., 31.
 Reynolds, M. S., 592.
 Reynolds, R. R., 159.
 Reynolds, R. V., 227.
 Rhian, M., 278, 404, 562, 612.
 Rhoad, A. O., 98.
 Rhoades, H. F., 634.
 Rhoads, A. S., 387, 531, 542.
 Rhoads, T. F., 607.
 Rhode, C. S., 265, 584.
 Rhodes, A. F. P., 380.
 Rice, J. W., 848.
 Rice, W. N., 228.
 Rich, C. E., 8, 603.
 Rich, H., 680.

 Rich, S., 538.
 Richards, B. L., 387.
 Richards, C. A., 528.
 Richards, L. A., 186, 674, 772, 781.
 Richards, M. C., 378.
 Richardson, B. T., 880.
 Richardson, C. H., 87, 247, 248, 249.
 Richardson, D. M., 877.
 Richardson, F., 545.
 Richardson, H. H., 825.
 Richardson, J. K., 533.
 Richardson, L. R., 98, 145, 147, 839.
 Richardson, P., 213.
 Richmond, M. S., 706.
 Richter, H. P., 866.
 Richter, J. H., 284, 307, 435.
 Rick, C. M., 31, 46.
 Ricker, C. C., 429.
 Rickett, H. W., 32.
 Kicks, W. D., 64.
 Riddet, W., 844.
 Riddle, O., 136.
 Riedl, W. A., 508.
 Riegan, G. H., 505, 528.
 Riegan, W. H., 478.
 Riemer, S. H., 609.
 Ries, V. H., 523.
 Riesbol, H. S., 631, 725.
 Riker, A. J., 34, 524, 528, 681.
 Riley, E. D., 159.
 Riley, G. M., 502.
 Riley, H. P., 652.
 Riley, H. W., 120.
 Riley, J. A., 367.
 Riley, W. A., 403.
 Rimington, C., 620.
 Rinehart, E. F., 697.
 Rinehart, R. E., 177.
 Ring, J. R., 654.
 Ringrose, A. T., 610.
 Ringrose, R. C., 403, 559.
 Riollano, A., 221, 229.
 Rischkov, V. L., 813.
 Ritcher, A. E., 545.
 Ritcher, P. O., 396.
 Ritchey, G. E., 791.
 Ritchie, W. S., 330, 760.
 Ritter, G. J., 776.
 Rivera Brenes, A., 184, 213.
 Roark, R. C., 87, 247, 306, 821, 825.
 Robbins, E. B., 502.
 Robbins, R. C., 152, 458.
 Robbins, W. A., 512.
 Robbins, W. J., 194, 350, 488, 644, 645.
 Robbins, W. W., 57.
 Robert, J. C., 213.
 Roberts, E., 496, 554, 788.
 Roberts, E. A. H., 355.
 Roberts, F. H. S., 569.
 Roberts, G., 345.

- Roberts, J. 103, 278, 279, 282, 404.
 Roberts, J. L., 488, 638, 659.
 Roberts, J. W., 231, 240.
 Roberts, L. M., 206.
 Roberts, O. C., 800.
 Roberts, R. C., 343.
 Roberts, R. E., 697.
 Roberts, R. H., 505.
 Robertson, D. W., 188, 217, 219, 507, 511.
 Robertson, E. C., 594.
 Robertson, E. I., 278, 404.
 Robertson, G. G., 497.
 Robertson, J. D., 451.
 Robertson, L., 588, 730.
 Robertson, L. S., 730.
 Robertson, M., 113.
 Robertson, R. N., 201.
 Robeson, C. D., 892.
 Robichaux, R. P., 849.
 Robinow, C. F., 349.
 Robinson, C. H., 257.
 Robinson, E. M., 421.
 Robinson, J. L., 212, 214, 215, 256, 277.
 Robinson, R. R., 641.
 Robinson, T. R., 523.
 Robinson, T. W., 32.
 Robinson, W. D., 149.
 Robinson, W. O., 190.
 Robinton, E. D., 107.
 Robison, U. M., 448.
 Robotka, F., 283, 284.
 Robscheit-Robbins, F. S., 896.
 Rock, C. L., 631.
 Rodenhiser, H. A., 71, 72.
 Roderick, D. B., 371, 411.
 Roderick, L. M., 714.
 Rodgers, P. D., 127.
 Rodigin, M. N., 229.
 Rodríguez Torrent, R., 181, 213.
 Roe, J. H., 624.
 Roe, M. A., 629.
 Roepke, M. H., 568.
 Roeser, J., Jr., 341.
 Roessler, E. B., 59.
 Roest, P. K., 284.
 Roets, G. C. S., 851.
 Rogers, C., 127.
 Rogers, C. H., 37.
 Rogers, J. S., 552.
 Rogers, L. A., 416.
 Rogers, L. H., 760, 799, 806.
 Rogers, W. P., 421.
 Rogosa, M., 83.
 Rogosheski, E. R., 588.
 Rohde, H. W., 330.
 Roller, E. M., 842, 367.
 Roman, H., 206.
 Romanoff, A. L., 47, 790.
 Romell, L.-G., 230.
 Romine, D. S., 642.
 Romm, H. J., 191.
 Romney, V. E., 394.
 Roney, J. N., 247.
 Ronkin, R. R., 202.
 Roque, A., 213, 229, 373, 386.
 Rose, J. J., 100.
 Rose, M. S., 740.
 Rose, V. T., 272.
 Rose, W. C., 744, 745.
 Roselle, R. E., 393.
 Rosen, H. R., 66, 664.
 Rosenbaum, W. M., 156.
 Rosenblatt, M., 338.
 Rosenblum, L. A., 890.
 Rosendahl, R. O., 524.
 Rosenfeld, I., 468.
 Rosenstiel, C., 159.
 Ross, A. F., 228.
 Ross, C. B., 678.
 Ross, H. H., 545.
 Ross, O. B., 98, 554.
 Ross, R. C., 583.
 Ross, W. A., 578.
 Ross, W. H., 330, 331.
 Rossiter, F. J., 285.
 Rost, C. O., 181, 611.
 Roth, H., 718.
 Rothwell, G., 659.
 Roughton, F. J. W., 177.
 Rounds, M. B., 241.
 Routh, J. I., 593, 698.
 Roveda, R. J., 554.
 Rowe, P. B., 601.
 Rowe, S., 610.
 Rowlands, I. W., 50.
 Royce, H. D., 176.
 Rozeboom, L. E., 696.
 Rozman, D., 292.
 Ruben, S., 202.
 Rubin, B. A., 780.
 Rubin, H. I., 856.
 Rubins, E., 100.
 Ruchhoft, C. C., 179.
 Rude, C. S., 791.
 Ruden, W. L., 868.
 Ruche, H. A., 562.
 Ruehle, G. D., 534, 799, 806.
 Ruggles, A. G., 95.
 Ruhland, G. C., 608.
 Ruhland, H. H., 853.
 Rule, A. M., 564.
 Runnells, R. A., 564, 718.
 Runnels, H. A., 817.
 Rupel, I. W., 209, 410, 504, 554, 705.
 Ruprecht, R. W., 799.
 Rush, D. R., 435.
 Rush, K. K., 707.
 Rusinow, I., 587.
 Rusk, H. P., 496, 504, 554, 700.
 Rusoff, I. I., 167.
 Rusoff, L. L., 833, 842.
 Russel, J. C., 122.
 Russell, M. B., 182, 183, 212, 632, 633.
 Russell, P. F., 96, 392, 402.
 Russell, S., 866.
 Russell, W. C., 410.
 Ruster, M., 258.
 Ruth, W. A., 518.
 Rutherford, E., 889.
 Rutherford, H. A., 158.
 Rutland, J. P., 44.
 Ryan, B., 135, 300.
 Ryker, T. C., 232.
 Sabin, A. B., 305.
 Sabrosky, C. W., 90, 256.
 Sacca, R. A., 387.
 Sackman, R. F., 367.
 Sackville, J. P., 716.
 Sadasivan, V., 883.
 Sagara, T., 481.
 Sage, E. C., 156.
 Sahni, P. N., 21.
 St. Clair, L. E., 113.
 St. John, J. L., 330, 333, 372, 404, 418.
 Saksena, R. K., 351.
 Sakvarclidze, N. A., 529.
 Sale, J. W., 330.
 Salisbury, G. W., 47, 103, 109.
 Salit, P. W., 172.
 Salle, A. J., 34.
 Salmon, O. N., 99, 101.
 Salmon, S. C., 864.
 Salter, L. A., Jr., 582.
 Sampson, A. W., 661, 803.
 Sampson, J., 564, 856.
 Sampson, K., 810.
 Samson, R. W., 659, 679.
 Sanborn, B. G., 55.
 Sanborn, J. R., 20, 104, 181, 848.
 Sanborn, R., 788.
 San Clemente, C. L., 722.
 Sanctuary, W. C., 788, 837, 860.
 Sanders, D. A., 842, 851.
 Sanders, G. E., 553.
 Sanders, G. P., 410.
 Sanders, K. B., 342.
 Sanders, M., 567.
 Sanderson, M. W., 549, 900.
 Sandstedt, R. M., 328, 472, 489.
 Sandstrom, W. M., 179.
 Sandza, J. G., 456.
 Saphra, I., 712.
 Sarett, H. P., 601, 602.
 Sargent, M., 468.
 Sarvis, J. T., 699.
 Sass, J. E., 191, 220.
 Satakopan, V., 182.
 Satina, S., 31.
 Sattar, A., 232.
 Satterfield, G. H., 14, 138, 706, 894, 895.
 Satterthwait, A. F., 95.
 Saunders, F., 420.
 Saura, F., 204.
 Savage, E. F., 375.
 Savage, E. S., 47, 103.

- Savage, Z., 869.
 Savile, D. B. O., 695.
 Săvulescu, T., 538.
 Sawin, P. B., 496.
 Sawitz, W., 392, 852.
 Sawyer, R. A., 170.
 Saxton, J. A., 99.
 Saxton, J. A., Jr., 501.
 Sayre, C. B., 222, 775.
 Scalf, R. E., 34.
 Scarseth, G. D., 650, 725.
 Scarth, G. W., 650.
 Schaars, M. A., 410.
 Schacht, F. L., 106.
 Schaefer, A. E., 332, 558, 570.
 Schaefer, C. W., 546.
 Schaefer, E. G., 367, 369.
 Schafer, G. M., 633.
 Schable, P. J., 274.
 Schall, E. D., 466, 668.
 Schaller, F. W., 641.
 Schaller, J. A., 411, 433.
 Schaller, J. W., 591.
 Schalm, O. W., 421, 422, 713.
 Schantz, V. S., 544.
 Schappelle, 221, 229.
 Schelb, B. J., 269.
 Schenck, J. R., 745.
 Scherago, M., 866.
 Schermerhorn, L. G., 669.
 Schickele, R., 283.
 Schiefer, H. F., 753.
 Schiel, E., 542.
 Schindler, A. J., 812.
 Schlegelmilch, R. O., 120.
 Schlehuber, A. M., 509.
 Schlesinger, R. W., 560, 717.
 Schlutz, F. W., 596.
 Schmid, A. R., 31.
 Schmidt, A. K., 294.
 Schmidt, H., 272.
 Schmidt, W. M., 744.
 Schmiedeler, E., 586.
 Schmitt, C. G., 67.
 Schmitt, J. B., 826.
 Schmitz, H., 819.
 Schneider, B. H., 837.
 Schneider, C. L., 40, 488, 778.
 Schneider, C. W., 801.
 Schneider, I. F., 867.
 Schnell, L., 31.
 Schnetzler, E. E., 655, 709.
 Schoenbach, E. B., 813.
 Schoene, W. J., 828.
 Schoenheimer, R., 698.
 Schoenheimer, S. G., 361.
 Schofield, W. C., 611.
 Schogoleff, C., 896.
 Scholes, J. C., 722.
 Schooley, J. P., 655.
 Schott, B. G., 210, 556.
 Schreffer, C. B., 12.
 Schroeder, E. M., 32, 648.
 Schroeder, J. W., 98.
 Schroeder, R. A., 52, 57, 186.
 Schteingart, M., 362.
 Schnette, H. A., 146.
 Schulte, R. B., 512.
 Schultz, D. K., 659.
 Schultz, H. K., 679.
 Schultz, J. H., 372.
 Schultz, T. W., 283, 284.
 Schulz, J. A., 209, 303.
 Schumacher, A. E., 276.
 Schurman, I., 830.
 Schuster, G. L., 212, 322.
 Schwantes, A. J., 297, 578, 863.
 Schwaradt, H. H., 90, 826, 831.
 Schwarte, L. H., 714.
 Schwartz, B., 567.
 Schwartz, H., 582, 583.
 Schwartz, C. D., 372, 378.
 Schwartz, S. W., 435.
 Schwarz, E. R., 157, 462, 752.
 Schweitzer, T. R., 532.
 Schwendiman, A., 505.
 Schwendiman, J. L., 367.
 Schwitzgebel, R. B., 549.
 Sciarra, D., 749.
 Scott, C. B., 679.
 Scott, C. L., 897.
 Scott, F. M., 31.
 Scott, H. M., 364, 496.
 Scott, J. P., 48.
 Scott, J. W., 719, 851.
 Scott, L. E., 371.
 Scott, M. L., 11.
 Scott, T. G., 245.
 Scott, V. E., 287.
 Scott, W. A., 593.
 Scott, W. C., 337.
 Scouler, F. L., 596.
 Scoville, G. P., 129.
 Scoville, O. J., 292.
 Scranton, C. J., 277.
 Scripture, P. N., 610.
 Scrivner, L. H., 567.
 Scudi, J. V., 11, 626.
 Scully, N. J., 352.
 Sealock, R. R., 884.
 Searcy, G. L., 501.
 Searls, E. M., 546.
 Searls, E. N., 583.
 Sears, A. C., 273.
 Sears, E. R., 52, 67, 85, 207.
 Sears, O. H., 503.
 Sears, P. D., 843.
 Seath, D. M., 290, 411, 412, 848.
 Seaton, D. R., 111.
 Seaton, H. L., 18, 19, 140.
 Sebrell, W. H., 111, 312, 480.
 Sechrist, W. C., 227.
 Seegers, W. H., 166.
 Seely, C., 367.
 Seftick, H. J., 376.
 Segal, D. B., 850.
 Seiferle, E. J., 170, 249.
 Seifritz, W., 640, 650.
 Sefn, F., Jr., 248, 824.
 Seleen, W. A., 32.
 Self, F. W., 369.
 Selim, A. G., 233.
 Sell, H. M., 332, 799.
 Sellei, H., 780.
 Sellei, J., 780.
 Sellers, T. F., 719.
 Sells, R. L., 607.
 Selman, I. W., 690.
 Selye, H., 51, 654, 655.
 Semenluk, G., 212, 228, 277, 491.
 Semple, A. T., 793.
 Senior, B. J., 261.
 Serrallés, J. J., Jr., 284.
 Serrano, L. A., 213, 221.
 Sesler, C. L., 193.
 Severac, M., 853.
 Severens, J. M., 496.
 Severin, H. C., 546.
 Severson, A., 836.
 Sexauer, T. E., 802.
 Shafer, J., Jr., 197.
 Shafer, J. I., 32.
 Shaffner, C. S., 655.
 Shafluk, M., 92.
 Shahan, M. S., 419, 718.
 Shands, H. L., 505.
 Shanon, L., 808.
 Shapiro, B., 710.
 Shapton, W. W., 545.
 Sharman, B. C., 358.
 Sharp, D. G., 424.
 Sharp, M. A., 125, 428, 728.
 Sharp, P. F., 4, 104, 175.
 Sharpe, C. F. S., 764.
 Sharvelle, E. G., 377.
 Shaulis, N., 513.
 Shaw, B., 24.
 Shaw, H., 306.
 Shaw, J. C., 105, 568.
 Shaw, J. H., 314.
 Shaw, J. K., 769, 800.
 Shaw, J. N., 116, 854, 856.
 Shaw, K. J., 66, 70.
 Shaw, L., 66.
 Shaw, S. T., 61.
 Shaw, W. M., 330, 343.
 Shawl, R. I., 573.
 Shealy, A. L., 102, 787, 833.
 Shear, C. L., 487.
 Shear, S. W., 442, 876.
 Shearer, P. S., 209, 256, 283.
 Shedd, C. K., 123, 214, 277, 284, 862, 863.
 Sheehy, E. J., 260, 261.
 Sheely, W. J., 102.
 Sheets, O., 144, 740.
 Sheffield, F. M. L., 384.
 Shelden, M. G., 819.
 Shema, B. F., 181, 348.
 Shen, T., 61.
 Shepard, H. R., 32.
 Shepek, E., 452.
 Shepherd, D. R., 228.
 Shepherd, G. S., 283.
 Shepherd, J. L., 124.

- Sherbakoff, C. D., 367, 378.
 Sherburne, R. E., 301.
 Sherman, C. B., 306.
 Sherman, F., 393.
 Sherman, F. III, 831.
 Sherman, G. D., 198, 610.
 Sherman, H. C., 143, 452, 453, 457.
 Sherman, J. M., 32, 104, 109, 420, 776.
 Sherman, L. K., 632.
 Sherman, M. S., 478.
 Sherman, W. C., 698, 740.
 Sherwood, H. N., 610.
 Sherwood, R. C., 604.
 Shetlar, M. R., 148.
 Shiffriss, O., 57, 787.
 Shigley, J. F., 115, 422.
 Shils, M. E., 149, 315.
 Shinnars, L. H., 36.
 Shipley, A. M., 842.
 Shipley, M. A., 662, 795.
 Shippy, W. B., 806.
 Shirck, F. H., 694.
 Shirk, H. G., 467, 492.
 Shirky, S. B., 159.
 Shive, J. W., 483, 492, 782.
 Sholl, L. B., 712.
 Shorb, D. A., 570.
 Shoshlavi, I. I., 529.
 Shotwell, R. L., 249.
 Showalter, J. W., 67.
 Shrader, J. A., 610.
 Shrader, J. C., 309.
 Shreve, F., 347, 485, 487.
 Shrewsbury, C. L., 97, 98, 404, 556, 557, 616, 697.
 Shropshire, L. H., 545.
 Shuey, G. A., 327, 404, 411.
 Shukers, C. F., 596.
 Shull, G. M., 626, 698.
 Shull, W. E., 694.
 Shupe, I. S., 477.
 Shwachman, H., 606.
 Sibbitt, L. D., 55, 512, 627.
 Siegel, H., 461.
 Siegel, L., 622.
 Siegler, E. A., 386.
 Siegler, E. H., 253, 821, 829.
 Sieling, D. H., 173, 769.
 Sierp, H., 776.
 Sievers, F. J., 899.
 Silberschmidt, K., 75, 77, 81, 235, 535.
 Silberstein, L., 354.
 Silcox, W. B., 104.
 Sill, F. B., 843.
 Silver, E. A., 862.
 Simmonds, S., 745.
 Simmons, P., 250.
 Simms, B. T., 272.
 Simons, J. S., 221, 800.
 Simons, J. W., 128.
 Simonson, R. W., 183, 283.
 Simpson, D. M., 216.
 Simpson, F., 554.
 Simpson, G. W., 213, 228, 248.
 Simpson, M. E., 266, 267, 361, 362, 404, 501, 503, 655, 834.
 Simpson, R. B., 586.
 Sims, G. T., 768.
 Sinclair, G. M., 610.
 Sinclair, R. D., 716.
 Sinclair, R. G., 454.
 Sinclair, W. B., 224, 522, 674.
 Sinden, J. W., 513.
 Singh, B. N., 195.
 Singleton, H. P., 343, 367, 404, 447, 835.
 Singsen, E. P., 721.
 Sinnott, E. W., 205, 650.
 Sinton, F. C., 330.
 Sipe, G. R., 840.
 Sisler, G. P., 372, 395.
 Sisson, W. A., 43.
 Sjogren, J. W., 127.
 Skaptason, J. B., 67, 383.
 Skelton, D. A., 582.
 Skelton, R. F., 579.
 Skinner, J. H., 160.
 Skinner, J. T., 610.
 Skiver, C. E., 659.
 Skoglund, W. C., 260, 546.
 Skok, J., 78.
 Skoog, F., 778.
 Slade, H. D., 348.
 Slanetz, L. W., 421.
 Slate, G. L., 376, 520, 802.
 Slate, W. L., 899.
 Slater, C. P., 136.
 Slater, L. E., 729, 730.
 Slatter, W. L., 107.
 Slattery, H., 278.
 Sletto, R. F., 301.
 Sloan, J. E. N., 857.
 Sloan, R. F., 467.
 Slocum, W. L., 737.
 Smiley, K. L., 32.
 Smirnova, V. A., 813.
 Smith, A. H., 315, 599, 600.
 Smith, A. I., 31, 490.
 Smith, A. K., 618.
 Smith, C. O., 80, 229.
 Smith, D., 504.
 Smith, D. J., 80, 787, 833.
 Smith, D. J. W., 111.
 Smith, D. R., 821.
 Smith, E. C., 31, 115, 635.
 Smith, E. H., 822.
 Smith, E. L., 744.
 Smith, E. V., 694.
 Smith, F., 528.
 Smith, F. B., 768, 772, 791.
 Smith, F. F., 242.
 Smith, F. H., 31.
 Smith, F. L., 2nd, 476.
 Smith, F. V., 729, 730.
 Smith, G., 107.
 Smith, G. D., 482.
 Smith, G. E., 22, 696.
 Smith, G. F., 358.
 Smith, G. L., 91.
 Smith, G. M., 659, 668.
 Smith, G. S. G., 418.
 Smith, H. L., 187.
 Smith, H. M., 343.
 Smith, H. S., 219, 370, 511.
 Smith, H. V., 462.
 Smith, H. W., 619, 634.
 Smith, J. B., 100, 330, 331.
 Smith, J. E., 376.
 Smith, J. H. C., 485.
 Smith, K. M., 69.
 Smith, L., 52, 67, 85, 359.
 Smith, L. E., 417, 821.
 Smith, L. I., 4.
 Smith, L. J., 278, 428.
 Smith, M. A., 67.
 Smith, M. B., 247, 440, 679.
 Smith, O., 53, 58.
 Smith, P. A., 776.
 Smith, P. C., 98.
 Smith, P. F., 195.
 Smith, R. C., 401.
 Smith, R. E., 395.
 Smith, R. L., 367.
 Smith, R. M., 601.
 Smith, R. S., 482.
 Smith, S. E., 85, 407, 840, 858.
 Smith, S. S., 548.
 Smith, T. E., 66, 76.
 Smith, T. J., 31.
 Smith, T. J., 738, 877.
 Smith, T. O., 347.
 Smith, V., 367.
 Smith, V. T., 343.
 Smith, W. K., 504.
 Smith, W. W., 85, 393.
 Smock, R. M., 61, 540.
 Smoyer, K. M., 241.
 Smucker, S. J., 389, 550, 833.
 Smyth, J. D., 363.
 Snapp, R. K., 554.
 Snedecor, G. W., 182, 183, 212.
 Snedeker, L., 896.
 Snell, A. M., 461.
 Snell, E. E., 12, 619.
 Snell, G. D., 48.
 Snell, K., 534.
 Snell, W. H., 818.
 Snelling, R. O., 503, 545.
 Snider, G. G., 449.
 Snider, H. J., 482.
 Snieszko, S. F., 34.
 Snow, R., 786.
 Snyder, G. B., 59, 370, 800.
 Snyder, R. S., 337, 632, 708.
 Snyder, W. C., 35, 70, 194, 235, 533, 538.
 Sobin, B., 33.
 Soderwall, A. L., 499.
 Sognnaes, R. F., 462.
 Soine, O. C., 611.
 Sokoloff, V. P., 548.
 Solomon, M. D., 485.
 Somers, I. I., 782.
 Sommaripa, A., 820.

- Sommer, A. L., 198, 775.
 Sommers, S. C., 497.
 Soraci, F. A., 392.
 Soriano, A. M. de, 485.
 Soskin, S., 454.
 Sotola, J., 278, 404.
 Soule, M. H., 566.
 Southwick, F. W., 61, 540.
 Southwick, L., 800.
 Souza, O. F. de, 235.
 Sowell, D. F., 833.
 Spangler, R. E., 209, 657.
 Spangler, R. L., 299.
 Sparks, W. C., 665.
 Sparrow, A. H., 46.
 Spawn, G. B., 546.
 Spedding, F. H., 165.
 Speers, C. F., 398.
 Spencer, D. A., 210, 556.
 Spencer, E. L., 814.
 Spencer, G. J., 90.
 Spencer, L., 104, 129, 442.
 Sperling, G., 47, 99.
 Speyer, E. R., 551.
 Spindler, L. A., 423.
 Spitzer, E. H., 702, 718.
 Spoehr, H. A., 485, 783.
 Sponsler, C. L., 650.
 Sprague, G. F., 52, 67, 85, 165, 214, 228, 303.
 Sprague, H. B., 369, 483, 563.
 Sprague, K. D., 564.
 Sprague, R., 70, 72, 231, 680, 682, 805.
 Spraul, J. R., 121.
 Sprince, H., 813.
 Springer, E. M., 22.
 Sproat, B. B., 212.
 Spulnick, J. B., 347.
 Spur, B., 708.
 Spurlock, A. H., 788.
 Spurway, C. H., 18.
 Sreenivasan, A., 883.
 Stabler, R. M., 421.
 Stadler, L. J., 52, 67, 85, 206.
 Stadler, L. S., 85.
 Staehelin, M., 802.
 Stahelin, R., 182.
 Stahl, A. L., 372, 760, 799.
 Stahl, B. M., 864.
 Stahl, C. A., 612.
 Stahly, G. L., 33, 193.
 Stahmann, M., 528.
 Stains, G. S., 398.
 Stair, E. C., 668.
 Staker, E. V., 23.
 Stakman, E. C., 688.
 Stamler, F. W., 561.
 Stamm, A. J., 170.
 Stamp, L. D., 756.
 Stanberry, C. O., 343.
 Standen, J. H., 228.
 Standing, E. T., 243.
 Stanford, G., 183, 663.
 Stanley, F. E., 129.
 Stanley, J., 399.
 Stanley, W. M., 77, 237, 384, 385.
 Stanley, W. W., 87.
 Stanton, E. F., 833.
 Stanton, T. E., 121.
 Stanton, T. R., 684, 812.
 Staples, C. H., 412.
 Staples, R., 90.
 Stark, A. L., 733, 741.
 Stark, C. N., 32, 269.
 Stark, F. L., Jr., 819.
 Stark, W. H., 34.
 Starker, T. J., 577, 804.
 Starkey, L. V., 403.
 Starkey, W. F., 502.
 Starr, G. H., 692.
 Starr, M., 4.
 Starr, M. P., 809.
 Starzak, J. A., 302.
 Staten, G., 683.
 Staten, H. W., 664.
 Stauffer, R. S., 482.
 Steadman, L. T., 462.
 Stearns, C. R., Jr., 760.
 Stearns, L. A., 245, 393.
 Stevenson, H. A., 525.
 Stebbins, G. L., Jr., 31, 46, 776.
 Steckel, J. E., 466.
 Steensma, R., 47.
 Steer, W., 395, 396.
 Steggerda, M., 137.
 Stein, C. D., 718.
 Stein, K. F., 789.
 Stein, M. H., 603.
 Stein, R. W., 849.
 Steinbauer, G. F., 219.
 Steinberg, R. A., 197, 379, 647.
 Steiner, H. M., 247, 546, 547.
 Steiner, L. F., 694.
 Steinweden, J. B., 548.
 Stene, A. E., 521.
 Stenswick, M., 610.
 Stephenson, R. B., 810.
 Stephenson, R. E., 641.
 Stepp, J. M., 441.
 Sterges, A. J., 349.
 Stern, J. R., 201.
 Stern, R. M., 34.
 Stetson, H. T., 22.
 Stevens, D., 313.
 Stevens, F. D., 791.
 Stevens, H. E., 523.
 Stevens, K. R., 846.
 Stevens, N. E., 527, 805, 816.
 Stevens, O. A., 667, 820.
 Stevens, R. L., 429.
 Stevenson, D. D., 524.
 Stevenson, F. J., 228.
 Stevenson, J. A., 527.
 Stewart, A. B., 570.
 Stewart, C. P., 623.
 Stewart, G. F., 165, 256, 303, 703, 837, 881.
 Stewart, H. L., 293, 582.
 Stewart, J., 570.
 Stewart, J. D., 271.
 Stewart, M. A., 89.
 Stewart, R. W., 331.
 Stewart, T. G., 507.
 Stewart, W. S., 186, 344, 779.
 Steyn, D. G., 851.
 Stiebeling, H. K., 136, 591.
 Stier, H. L., 238, 467.
 Stiles, G. W., 572.
 Stoa, T. E., 55, 188, 217, 369, 512.
 Stockard, C. R., 211.
 Stoddard, D. L., 238.
 Stoddard, E. M., 230.
 Stoddard, M. P., 4.
 Stoeck, J. A., 97.
 Stokes, J., Jr., 607.
 Stokes, J. L., 34, 192, 852.
 Stokes, W. E., 257, 791.
 Stoller, B. B., 347.
 Stonaker, H. H., 656.
 Stone, C. L., 676.
 Stone, P. C., 393.
 Stone, R. W., 33, 193, 413.
 Stone, W. S., 363.
 Storer, T. I., 694.
 Storie, R. E., 755.
 Stormont, C., 854.
 Storrs, A. B., 178.
 Stout, D. C., 389.
 Stout, E. E., 754.
 Stout, G. J., 513.
 Stout, R. E., 840.
 Stout, W., 574.
 Stover, D., 425.
 Stover, D. E., 571, 722.
 Stowell, R. E., 363.
 Strachan, C. C., 760.
 Strain, H. H., 485, 627. —
 Strand, A. B., 367, 371, 660.
 Straub, G. J., 9, 10, 148.
 Straub, L. G., 631.
 Strauss, A. F., 338.
 Strauss, L., 712.
 Strawinski, R. J., 33.
 Street, H. R., 147, 749.
 Street, O. E., 504.
 Strickland, E. H., 247.
 Stringfield, G. H., 252, 360.
 Stroman, G. N., 54.
 Strong, L. A., 87.
 Strong, L. C., 498.
 Strong, R. A., 156.
 Struble, G. R., 95.
 Stuart, L. S., 33.
 Stuart, N. W., 779.
 Stubbs, E. L., 272, 710.
 Stuckey, J. H., 196, 203.
 Struckmeyer, B. E., 32, 505.
 Studhalter, R. A., 67.
 Studholme, A. T., 544.
 Stumbo, C. R., 688.
 Sturgis, C. C., 454, 455.
 Sturkie, D. G., 803.
 Sturkie, P. D., 211, 656.
 Sturm, J. J., 609.

- Sturtevant, A. P., 822.
 Sudds, R. H., 484.
 Sugihara, J., 139, 590, 752.
 Suit, R. F., 520.
 Sullivan, J., 405.
 Sullivan, J. L., 52.
 Sullivan, M. X., 5, 481.
 Sullivan, R. B., 819.
 Sullivan, W. G., 872.
 Sullivan, W. N., 254, 547, 821, 830.
 Sumner, H. C., 22.
 Sumner, J. B., 471.
 Sund, J., 483.
 Suncson, C. A., 382, 511, 687.
 Supplee, W. C., 100.
 Sure, B., 592, 698.
 Surface, F. M., 260.
 Sutherland, J. A., 496.
 Sutton, G. M., 86.
 Swain, L. A., 479.
 Swale, F. S., 571.
 Swales, W. E., 117, 570.
 Swallers, C. M., 55.
 Swaminathan, M., 480.
 Swanback, T. R., 796.
 Swanson, C. L. W., 333.
 Swanson, C. O., 471.
 Swanson, E. C., 900.
 Swanson, L. E., 116, 271.
 Swanson, P. P., 803.
 Swanson, R. W., 760.
 Swanson, W. R., 804.
 Swartley, J. C., 221.
 Swartwout, H. G., 57, 85.
 Swartz, D. B., 38.
 Sweet, M. H., 703.
 Sweet, R. D., 58.
 Sweet, W. W., 705.
 Sweetman, H. L., 247.
 Swensen, A. D., 840.
 Swenson, S. P., 367, 504.
 Swenson, T. L., 323.
 Swett, W. W., 844.
 Swezey, O. H., 89, 546.
 Swift, R. W., 99, 554, 555.
 Swingle, H. S., 694.
 Swingle, R. U., 692.
 Swingle, W. T., 35.
 Sykes, J. F., 105, 846.
 Sylvestre, P. E., 570.
 Taba, S. M., 349.
 Takacs, W. S., 553.
 Takahashi, W. N., 530, 628, 814.
 Talbert, T. J., 60, 375, 767.
 Talbot, M. W., 661, 755.
 Talley, P. J., 234.
 Tamiya, H., 193.
 Tanner, F. W., 305.
 Tanner, R., 882.
 Tanner, B., 556.
 Tarkow, L., 84, 761.
 Tattersfield, F., 825.
 Tatum, E. L., 208.
 Tatum, J. R., 466, 900.
 Taylor, A. B., 32.
 Taylor, A. R., 424.
 Taylor, C. M., 740.
 Taylor, D. L., 202.
 Taylor, H. G., 96.
 Taylor, J. B., 554.
 Taylor, L. V., 330.
 Taylor, M. H., 807.
 Taylor, R. M., 850.
 Taylor, T. J., 858.
 Tchernomoretz, I., 119.
 Teas, H., 358, 628.
 Tedin, O., 459.
 Tehon, L. R., 81.
 Telford, H. S., 95, 695, 696, 820, 832.
 Temperton, H., 102, 559.
 Tenbet, J. N., 823.
 Teply, L. J., 698.
 Tepper, A. E., 275.
 Terrell, W. G., 100.
 Terrill, C. E., 97.
 Terry, D. E., 621, 750.
 Terry, R., 132.
 Tetreau, E. D., 135, 438, 877.
 Tharp, B. C., 32.
 Thatcher, F. S., 685.
 Thayer, C. L., 370, 800.
 Thayer, J. W., Jr., 795.
 Thayer, L. A., 32.
 Thayer, S. A., 461.
 Theophilus, D. R., 703.
 Thllessen, E. J., 880.
 Thirunalachar, M. J., 530.
 Thom, C., 617.
 Thomas, B. H., 97, 165, 256, 303.
 Thomas, C. A., 540, 824.
 Thomas, H. A., 632.
 Thomas, H. Earl, 244, 387.
 Thomas, H. R., 527.
 Thomas, J., 13.
 Thomas, L. C., 496.
 Thomas, P. T., 672.
 Thomas, R. C., 349.
 Thomas, R. H., 246.
 Thomas, W., 20.
 Thomas, W. P., 823, 733.
 Thompson, B. G., 391.
 Thompson, G. B., 401.
 Thompson, H. C., 23, 53, 57.
 Thompson, J. N., 697.
 Thompson, N. O., 583, 608.
 Thompson, R. B., 102, 127, 562.
 Thompson, R. C., 538.
 Thompson, R. R., 167.
 Thompson, S. H., 283.
 Thompson, S. H., Jr., 473.
 Thompson, S. Y., 142.
 Thompson, V. J., 512.
 Thompson, W. C., 658.
 Thompson, W. L., 549, 799, 822.
 Thompson, W. S., 738.
 Thompson, W. W., 714.
 Thornberry, H. H., 385, 805.
 Thorne, D. W., 350.
 Thorne, G. B., 98.
 Thorning, W. M., 274.
 Thornley, H. F., 247.
 Thornthwaite, C. W., 340, 632, 764.
 Thornton, B., 798.
 Thornton, B. J., 667.
 Thornton, H. G., 350.
 Thornton, M. H., 616.
 Thornton, N. C., 589, 645.
 Thornton, S. F., 196.
 Thorp, F., Jr., 570, 712.
 Thorp, R. H., 475.
 Thorp, W. T. S., 98, 114, 115, 422, 557.
 Threlkeld, W. L., 116, 713, 716.
 Thurston, H. W., Jr., 479, 528.
 Tidestrom, I., 194.
 Tldrick, R. T., 561.
 Tiedjens, V. A., 483, 669.
 Tiffany, H. S., 468, 800, 803, 806.
 Tilden, E. B., 485.
 Tilford, P. E., 243, 817.
 Tilley, K. W., 486.
 Tillson, A. H., 776.
 Tilson, H. G., 60, 370.
 Timberlake, P. H., 549.
 Timonin, M. I., 28.
 Timoshenko, V. P., 584.
 Tims, E. C., 527.
 Tinkham, E. R., 827.
 Tinley, J. M., 441, 582.
 Tintner, G., 283.
 Tippy, K. C., 577.
 Fischer, L. A., 553.
 Tisdale, W. B., 806, 810.
 Tisdall, F. F., 812, 593.
 Tishler, M., 852.
 Tissot, A. N., 822, 823.
 Tittsler, R. P., 33.
 Titus, H. W., 561, 698.
 Tobey, E. R., 221, 236.
 Tobey, J. A., 450.
 Tobin, C. E., 503.
 Tobiska, J. W., 834.
 Tocchetto, A., 534, 542.
 Todhunter, E. N., 139, 152, 447, 458.
 Toenjes, W., 801.
 Toepfer, B. W., 143.
 Toevs, J. L., 659, 679, 725, 729.
 Tolle, C. D., 331.
 Tolman, B., 795.
 Tom, R. C., 835.
 Tomhave, A. E., 212, 260.
 Tomlinson, W. E., Jr., 820.
 Tomoi, T., 481.
 Tompkins, C. M., 94, 817.
 Tonn, W. H., 818.

- Toole, E. H., 514.
 Toomey, J. A., 553.
 Torgeson, O. W., 526.
 Torrie, J., 505.
 Tory, H. M., 30.
 Tottingham, W. E., 473, 505.
 Tower, B. A., 701.
 Townsend, C. H. T., 401.
 Townsend, G. R., 538, 799, 808.
 Tracy, P. H., 416, 850.
 Trainer, J. B., 425.
 Traub, H. P., 523.
 Traum, J., 713.
 Trelease, S. F., 37, 711.
 Trembley, G., 546.
 Trembley, H. L., 96.
 Trenk, F. B., 525.
 Trenner, N. R., 852.
 Trent, J. A., 485.
 Tressler, C. J., 180.
 Tressler, D. K., 305, 450, 751.
 Triebold, H., 524.
 Tripp, F., 138, 457.
 Tripp, L. H., 421.
 Troeschel-Elam, E., 749.
 Trombeta, V. V., 650.
 Trout, G. M., 268, 848.
 Trowbridge, E. A., 98.
 Trullinger, R. W., 609.
 Truog, E., 513.
 Trussell, R. E., 713.
 Tse-Chiu Kuo, L., 445.
 Tsereteli, L. I. A., 529.
 Tsu, S. T., 590.
 Tucker, C. M., 67, 381, 530, 815, 817.
 Tucker, E. A., 435.
 Tucker, E. K., 330.
 Tucker, L. R., 20.
 Tullis, E. C., 71.
 Tunison, A. V., 85.
 Tunnelcliff, E. A., 715.
 Turner, C. W., 103, 265, 266, 267, 705, 845.
 Turner, E. L., 694.
 Turner, J. D., 100, 775.
 Turner, K. B., 790.
 Turner, N., 68, 231.
 Turney, G. J., 268, 270.
 Turrell, F. M., 651.
 Tutthill, C. S., 67.
 Twichell, A. A., 609.
 Twinn, C. R., 397.
 Tyler, C., 408.
 Tyler, L. J., 67.
 Tysdal, H. M., 662.
 Uber, F. M., 169, 206.
 Ullstrup, A. J., 659, 725.
 Ulrich, A., 491.
 Umbreit, W. W., 193.
 Underbjerg, G. K. L., 209, 657.
 Underkoffler, L. A., 176.
 Underwood, J. K., 367.
 Underwood, P. C., 705.
 Upholt, W. M., 393.
 Upp, C. W., 840.
 Upton, F., 213, 228.
 Urey, F. P., 142.
 Useem, J., 738.
 Utter, M. F., 35.
 Vachnadze, M. L., 529.
 Vail, C. E., 834.
 Vail, G. E., 98.
 Vajda, G., 145.
 Vajic, B., 458, 459.
 Valner, P., 330.
 Valgren, V. N., 439.
 Valteau, W. D., 229, 230, 383.
 Vallega, J., 71, 688.
 Van Blaricom, L. O., 338.
 Vandecaveye, S. C., 343, 346, 367, 639.
 Vandenbelt, J. M., 10, 762.
 Vanderford, H. B., 769.
 van der Merwe, C., 130, 876.
 Van der Meulen, D., 264, 795.
 Van Der Noot, G., 706.
 Van der Walt, S. J., 851.
 Van Doren, A., 61.
 Van Doren, C. A., 504.
 Van Duyn, F. O., 143, 456.
 van Duyvendijk, J. A., 402.
 Van Dyke, E. C., 89.
 Vane, A., 347.
 Van Fleet, D. S., 31, 205.
 Van Horn, C. W., 675.
 Van Landingham, A. H., 715, 837.
 Van Meter, R. A., 800.
 Van Niel, C. R., 202, 471.
 Van Overbeek, J., 781.
 Van Roedel, H., 858.
 Vanselow, A. P., 643.
 VanSlyke, E., 632, 659.
 Vanterpool, T. C., 231.
 Van Winkle, W., Jr., 451.
 Vardiman, P. H., 467.
 Vardossanidze, V. A., 529.
 Vargas, L., 255.
 Vargas, L. Jr., 51.
 Vaughan, P. J., 372.
 Vaughn, D. B., 83.
 Vaughn, E. C., 370.
 Vaughn, J. R., 236.
 Vavilov, N. I., 208.
 Veach, C. W., 124, 573.
 Veasey, C. A., Jr., 147.
 Veatch, J. O., 867.
 Verchhoff, O., 18, 19.
 Veihmeyer, F. J., 27, 518.
 Veldhuis, M. K., 18, 19, 327.
 Vélez, M., Jr., 284.
 Verberg, R. M., 837.
 Verbrugge, F., 169.
 Verner, L., 517, 616, 659, 671.
 Vernon, W. M., 837.
 Vestal, C. M., 655, 697, 725.
 Vickery, H. B., 168, 174, 454, 616, 744, 760.
 Vidal, E. N., 128.
 Vig, J. A., 302.
 Viets, F. G., 331.
 Viets, F. G., Jr., 646.
 Vigneaud, V. du, 166, 454, 745.
 Villamil, A. R., 617.
 Vincent, C. L., 367, 372.
 Vincent, H. B., 170.
 Vincent, J. M., 350.
 Vincent, R. H., 831.
 Vinson, C. G., 67, 145, 655.
 Vinson, J., 696.
 Vinzant, J. P., 823.
 Virgin, W. J., 66, 679.
 Visber, S. S., 22.
 Vittum, M. T., 346, 466.
 Vlasoff, P. I., 185.
 Voelcker, O. J., 817.
 Voelker, S. W., 285.
 Vogel, H. R., 193.
 Vogel, O. A., 367.
 Vogler, K. G., 193.
 Vogt, G. B., 821.
 Vollin, L., 285.
 Volk, G. M., 760, 768, 701.
 Volk, N. J., 345.
 Volkerding, B. F., 32.
 Volz, E. C., 212, 220.
 Vondell, J. H., 788, 837.
 Vonk, H. J., 471.
 Voorhees, R. K., 799, 806, 808.
 Voorhies, E. C., 732.
 Vorhies, C. T., 827.
 Voris, L., 546.
 Wade, B. L., 59, 373, 682.
 Wadsworth, S. E., 278, 372.
 Wagner, E. C., 172.
 Wagner, G. B., 395.
 Wagnon, K. A., 698.
 Wagoner, C., 900.
 Wagoner, J. A., 348.
 Walinfo, W. W., 698.
 Walsman, H. A., 11, 150.
 Wakeley, R. E., 283, 300.
 Wakeman, A. J., 174, 466.
 Waksman, S. A., 28, 33, 84, 348, 483, 486, 616.
 Wahl, G., 313, 749.
 Waldee, E. L., 212.
 Waldner, M., 738.
 Waldo, G. F., 224.
 Waldron, L. R., 55, 219, 512.
 Walker, A. G., 382.
 Walker, C. G., 577.
 Walker, G. P., 466, 659, 729.
 Walker, H. B., 445.
 Walker, H. G., 821, 829.
 Walker, J. C., 235, 513, 528.
 Walker, L. S., 330, 331, 834.
 Walker, M. N., 791, 806.

- Walker, R. H., 350.
 Walker, R. I., 360.
 Walker, S. A., 607.
 Walker, W. P., 585.
 Walkey, F. L., 709.
 Wall, M. L., 504.
 Wall, N. J., 438.
 Wall, R. F., 468.
 Wallace, A. M., 43.
 Wallace, H. A., 470.
 Wallace, J. J., 212.
 Wallace, R. W., 367.
 Waller, E. F., 720.
 Wallihan, E. F., 65.
 Wallin, L. W., 133.
 Wallis, G. C., 503.
 Walster, H. L., 55, 248, 719, 820, 877.
 Walter, E. D., 616.
 Walter, E. V., 694.
 Walter, W. G., 888.
 Walters, D. V., 521.
 Walters, J. L., 46.
 Walton, A., 47.
 Wang, Y. L., 762, 763.
 Wann, F. B., 542.
 Warbritton, V., 47.
 Ward, G. M., 707.
 Ward, I. J., 90.
 Ward, J. C., 544.
 Ward, M. MacD., 302.
 Ward, R., 395.
 Ward, W. F., 788, 791.
 Wardlaw, C. W., 241.
 Ware, L. M., 513.
 Waring, P. A., 639.
 Wark, D. C., 811.
 Warkow, R. F., 178.
 Warmke, H. E., 628.
 Warner, E. D., 561.
 Warner, J. D., 768, 791, 833.
 Warner, O. F., 129.
 Warren, E. L., 582.
 Warren, F. G., 563.
 Warren, G. F., Jr., 58.
 Warren, L. E., 330.
 Warren, S. W., 129.
 Warwick, E. J., 209.
 Washburn, L. E., 103.
 Waters, K. L., 336.
 Waters, N. F., 118.
 Waterston, J. M., 394.
 Watkins, J. M., 212, 260.
 Watkins, J. V., 225.
 Watkins, T. C., 90, 828.
 Watkins, W. E., 100.
 Watson, A. E., 436.
 Watson, C. J., 257.
 Watson, J., 564.
 Watson, J. C., 97, 554.
 Watson, J. R., 545, 547, 553, 806, 822, 823.
 Watson, W., 725.
 Watts, J. G., 393.
 Watts, R. L., 546.
 Waugh, A. V., 467.
 Waugh, F. V., 294.
 Waugh, R. K., 467, 709.
 Waxler, S. H., 119.
 Weakley, C. E., Jr., 715.
 Wear, J. I., 775.
 Weast, C. A., 18.
 Weatherby, E. J., 209.
 Weathers, E. K., 327.
 Weaver, J. E., 36.
 Weaver, J. W., Jr., 127.
 Weaver, L. A., 47, 98, 406.
 Weaver, L. O., 67.
 Weaver, R. H., 856.
 Weaver, R. J., 233.
 Webb, B. H., 709.
 Webb, L. W., Jr., 472.
 Webb, R. J., 554.
 Weber, A. D., 98.
 Weber, G., Jr., 632.
 Weber, G. F., 390, 806.
 Weber, G. R., 34.
 Webster, E. C., 655.
 Webster, J. E., 617, 673, 674.
 Webster, J. S., 566.
 Webster, L. T., 858.
 Webster, R. L., 92, 393, 395.
 Weddle, C., 46.
 Weeks, J. M., 213.
 Weetman, L. M., 664.
 Weidlein, W., 327.
 Weier, T. E., 200.
 Weihe, H. D., 167, 473.
 Weihing, R. M., 214, 507.
 Weil, J. W., 820.
 Weinard, F. F., 523.
 Weindling, R., 378.
 Weiness, H., 413.
 Weinman, C. J., 549.
 Weintroub, R. L., 196, 784.
 Weir, W. C., 554.
 Welser, H. H., 413.
 Weiss, F., 66, 82, 243, 377, 527, 680, 681, 805.
 Weiss, H. B., 392.
 Weiss, M. G., 212, 222.
 Weitzkamp, N. E., 655, 697.
 Welch, A. W., 79, 227.
 Welch, D. S., 67.
 Welch, H., 553.
 Welch, J. E., 611.
 Weld, W. A., 430, 860.
 Welden, W. C., 295.
 Weldon, M. D., 619.
 Wellman, F. L., 239.
 Wellman, H. R., 324, 442, 876.
 Wells, C. F., 289.
 Wells, D. G., 367.
 Wells, J. G., 803.
 Wells, L. J., 655.
 Wells, R. W., 247.
 Welsch, M., 33, 34.
 Wene, G., 549, 831.
 Wenger, L. E., 792.
 Went, F. W., 32, 38, 200, 353, 779, 780.
 Wentworth, E. N., 556.
 Wenzel, G., 792.
 Werch, S. C., 141, 142, 594.
 Werkman, C. H., 34, 35, 69, 165, 166, 168, 191, 192, 263, 348, 471.
 Werner, H. O., 204.
 Wernham, C. C., 528.
 Wershing, H. F., 525.
 Wert, J. E., 302.
 Wertz, A. W., 314, 880.
 Wessels, P. H., 23, 53, 58.
 West, C., 673.
 West, E., 806, 851.
 West, E. A., 59.
 West, E. S., 177.
 West, H. O., 870, 660, 795.
 West, J., 817.
 Western, J. H., 810.
 Westfall, B. A., 740.
 Westfall, R. J., 704.
 Weston, W. H., 75, 495.
 Westover, H. L., 662.
 Westover, K. C., 223.
 Wet, W. J. de, 397.
 Wetmore, P. W., 118.
 Weybrew, J. A., 900.
 Weymouth, F. W., 657.
 Wharton, M. A., 140.
 Whatley, J. A., Jr., 209.
 Wheeler, H. E., 236.
 Wheeler, K. E., 64.
 Wheeler, M. E., 293.
 Wheeler, N. C., 501, 655.
 Whetting, L. C., 343, 346, 372, 468.
 Whetstone, R. R., 190.
 Whipple, G. H., 896.
 Whitacre, J., 888.
 Whitaker, T. W., 805.
 Whitcomb, W. D., 547, 551, 820, 824.
 White, A., 58, 266, 654.
 White, B. E., 173.
 White, B. S., Jr., 610.
 White, D. G., 57.
 White, D. P., 65.
 White, E. A., 191.
 White, E. C., 33.
 White, E. L., 499.
 White, G. C., 568.
 White, H. E., 800, 806.
 White, H. J., 859.
 White, J. C., 104.
 White, J. I., 117.
 White, J. W., 482, 504, 616.
 White, P. R., 490, 781.
 White, W. E., 524.
 White, W. H., 391.
 Whiteford, C. L., 184.
 Whitehead, E. I., 612.
 Whitehead, H. R., 850.
 Whitehead, T., Jr., 772.
 Whitehouse, W. E., 676.
 Whitehurst, V. E., Jr., 116, 788, 833.
 Whiteside, A. G. D., 233.

- White-Stevens, R. H., 23, 53, 58, 514.
 Whitfield, W. R., 837.
 Whitford, N. B., 31.
 Whitlock, H. V., 392.
 Whitlock, J. H., 420.
 Whitman, E. W., 659.
 Whitmire, J. S., 516.
 Whitney, J. B., Jr., 52.
 Whitt, D. M., 575.
 Whitten, R. R., 832.
 Whittier, E. O., 33.
 Whittington, F. B., 830.
 Wiancko, A. T., 659.
 Wiant, D. E., 262.
 Wichmann, H. J., 330, 335.
 Wickard, C. R., 285, 470, 757, 759.
 Wickens, G. M., 807.
 Wickerham, L. J., 33.
 Wickline, W. L., 254.
 Widdowson, E. M., 594.
 Wiehl, D. G., 742, 743, 744.
 Wigzans, R. G., 53.
 Wilidakas, W., 215, 216.
 Wilbur, D. A., 247, 547, 549.
 Wilbur, J. W., 655, 704.
 Wilcke, H. L., 256, 270, 837.
 Wilcox, E., 468.
 Wilcox, J. C., 516.
 Wilcox, R. B., 224, 241, 527, 541.
 Wilcox, R. H., 584, 869.
 Wilcox, W. W., 283, 284.
 Wilcoxon, F., 87.
 Wilde, E. I., 513, 676, 803.
 Wilde, S. A., 483, 524, 525, 677.
 Wildman, J. D., 414.
 Wileman, R. H., 282, 679, 694, 725.
 Wiley, F. H., 330.
 Wiley, J. R., 697, 729.
 Wiley, W. H., 610.
 Wilkus, H. S., Jr., 838.
 Wilkie, J. B., 6, 330.
 Wilkins, W., 152.
 Willard, H. S., 842.
 Wilcox, J. S., 408.
 Willett, E. L., 47, 407, 408.
 Willett, H. C., 22.
 Willey, E. C., 281.
 Willham, O. S., 700.
 Williams, B. M., 348.
 Williams, C. B., 344.
 Williams, D. E., 404.
 Williams, D. W., 98.
 Williams, G. A., 730.
 Williams, I. L., 141.
 Williams, J. L., 655.
 Williams, L., 487.
 Williams, L. A., 900.
 Williams, L. F., 420.
 Williams, O. B., 34.
 Williams, P. C., 50.
 Williams, R. D., 480.
 Williams, R. J., 619.
 Williams, R. R., 450, 622.
 Williams, S., 318.
 Williams, S. B., 570.
 Williams, S. W., 871.
 Williams, T. L., 476.
 Williams, T. W., Jr., 629.
 Williams, V. R., 775.
 Williams, W. A., 868.
 Williams, W. L., 655.
 Williams, W. O., 477, 491.
 Williamson, C. B., 67, 82.
 Williamson, G., 407.
 Williamson, M. B., 267.
 Williamson, P. S., 129.
 Willis, L. G., 491.
 Willman, J. P., 47, 99, 101, 109.
 Willoughby, C. H., 787.
 Willm, H. G., 631.
 Wilmot, R. J., 799.
 Wilsie, C. P., 212, 222.
 Wilson, A., 542.
 Wilson, C. C., 32.
 Wilson, E. E., 540.
 Wilson, G. C., 791.
 Wilson, H. F., 398, 399, 516.
 Wilson, H. L., 107.
 Wilson, I. C., 466.
 Wilson, J. B., 33, 330, 352.
 Wilson, J. D., 78, 178, 239.
 Wilson, J. G., 655.
 Wilson, J. K., 103, 222.
 Wilson, J. W., 89, 95, 554, 822.
 Wilson, M. L., 136, 582.
 Wilson, P., 295.
 Wilson, P. W., 33, 195, 352, 777.
 Wilson, R. D., 389.
 Wilson, W. E., 73.
 Wilson, W. O., 554, 703.
 Wilson, W. T., 632.
 Wilster, G. H., 849.
 Wimer, D. C., 503.
 Winburn, T. F., 395.
 Winchester, C. F., 500.
 Windle, W. F., 156.
 Wingate, I. B., 752.
 Wingo, C. W., 85, 821.
 Winkler, W. O., 330.
 Winner, W. H., 299.
 Winslow, C. E. A., 608, 609.
 Winsor, C., 212.
 Winsor, H. W., 760, 791.
 Winter, A. R., 102.
 Winter, J. D., 886.
 Winternitz, J., 466.
 Winters, L. M., 210, 496, 657.
 Wise, E. C., 560.
 Wise, G. H., 411, 422, 854.
 Wislocki, G. B., 301, 499.
 Wisnicky, W., 118, 568, 702.
 With, T. K., 479.
 Withrow, R. B., 649.
 Witt, D. J., 226.
 Witz, R. L., 725, 754.
 Witzel, S., 574.
 Wolberg, F. B., 343, 411, 428, 640, 843.
 Wolcott, C. N., 89, 248, 256.
 Wolfe, A. C., 783.
 Wolff, D., 361.
 Wolman, I. J., 708.
 Womack, M., 745.
 Wong, C. Y., 223.
 Wood, C. A., 330, 337.
 Wood, C. R., 200.
 Wood, F. W., 424.
 Wood, H. G., 35, 166, 168, 192, 348.
 Wood, J. G., 201, 203.
 Wood, M. A., 880.
 Wood, S. F., 93.
 Wood, T., 287.
 Wood, T. R., 744.
 Wood, W. B., Jr., 271.
 Woodbridge, C. G., 62.
 Woodburn, R., 660.
 Woodbury, E. N., 694.
 Woodin, M. D., 134.
 Woodman, H. E., 406.
 Woodman, R. M., 535.
 Woodmansee, C. W., 347.
 Woodroof, J. G., 16, 882, 883.
 Woodroof, N. C., 235.
 Woodruff, C. M., 22, 771.
 Woodruff, H. B., 33, 34, 348, 486.
 Woodruff, L. L., 467.
 Woodruff, S., 588, 589.
 Woodruff, S. A., 170.
 Woods, E., 739.
 Woods, G. M., 424.
 Woods, J. T., 173.
 Woods, M. W., 237.
 Woods, P. W., 316.
 Woodside, A. M., 247.
 Woodward, C. R., Jr., 34, 192.
 Woodward, E. G., 104.
 Woodward, J. C., 233.
 Woodward, R. R., 555.
 Woodworth, C. M., 52, 503, 545.
 Wooley, J. C., 120, 433.
 Wooley, J. G., 111, 480.
 Woolley, D. W., 476, 594, 597, 841.
 Woolman, C. W., 100.
 Work, P., 53, 58.
 Work, S. H., 98.
 Working, E. J., 583.
 Worley, C. L., 39, 491, 778.
 Worthley, H. N., 247, 479, 546, 827.
 Wortis, H., 603.
 Worzella, W. W., 659.
 Wrenshall, C. L., 174, 188.
 Wright, E., 389.
 Wright, E. B., 399.
 Wright, E. Q., 466.

- Wright, J. C., 578.
Wright, J. G., 564.
Wright, K. T., 435.
Wright, L. D., 12, 456.
Wright, M. M., 841.
Wright, O. E., 596.
Wright, S. J., 756.
Wright, T., 554, 564.
Wright, V., 690.
Wright, W. L., 610.
Wrigley, P. I., 586.
Wylie, C. E., 411.
Wylie, K. H., 285.
Wylie, W. D., 90.
Wynd, F. L., 478, 536.
- Yale, M. W., 270.
Yamamoto, W., 242.
Yapp, W. W., 562.
Yarnell, S. H., 47.
Yarbrough, M., 895.
Yarnell, S. H., 899.
Yarwood, C. E., 531.
Yeager, A. F., 672.
Yeager, J. F., 253, 397.
Yeager, L. E., 301.
- Yeatman, F. W., 881.
Yee, J. Y., 171.
Yegian, H. M., 769, 792, 800.
Yerkes, A. P., 572, 862.
Ylengst, M. J., 272.
Yoder, L., 165, 256.
York, H. A., 366, 795.
York, H. H., 678.
Yothers, M. A., 395.
Young, A. L., 573.
Young, D. E., 868.
Young, E. C., 582, 729, 730.
Young, F. G., 845.
Young, H. A., 339.
Young, H. H., 98.
Young, P. A., 70, 359.
Young, R. E., 800.
Young, T. R., Jr., 522.
Young, V. H., 680.
Youngquist, C. V., 574.
Younkin, S. G., 67, 75.
Yu, T. F., 154.
Yuill, J. S., 254.
- Zahnley, J. W., 792.
Zalkowski, L., 258.
Zaumeier, W. J., 382, 385.
- Zayas Chardón, H., 284.
Zdanova, L. P., 780.
Zechmeister, L., 145, 200, 312.
Zehner, E., 574.
Zeigler, P. T., 836.
Zelle, M. R., 98, 556, 655.
Zeller, J. H., 209.
Zeller, S. M., 240, 377, 388, 816.
Zentmyer, G. A., 603.
Zilva, S. S., 895.
Zimmerman, E. C., 553.
Zimmerman, H. M., 147.
Zimmerman, P. W., 82.
Zimmerman, W. I., 180.
Zingg, A. W., 343, 575, 861.
Zink, C. E., 319.
Zink, F. J., 573.
Zinn, D. J., 628.
Zitlin, A., 365.
Zittle, C. A., 657.
Zondek, B., 710.
Zschelle, F. P., 41, 333, 616, 619, 694.
Zuber, M. S., 214, 215.
Zuccheri, P. J., 554.
Zundel, G. L., 381, 536, 605.

INDEX OF SUBJECTS

NOTE.—The abbreviations "Ala.", "Conn.[New Haven]", "Mass.", etc., after entries refer to the publications of the respective State experiment stations; "Hawaii" and "P.R.U." to those of the experiment stations in Hawaii and Puerto Rico (University station); and "U.S.D.A." to those of this Department.

- Abacá* dry sheath-rot, cause and control, 233.
Abies grandis johnsoni, description, 677.
 Abortion—*see also* Bang's disease and *Brucella abortus*.
 equine virus, Ky. 857.
 in ewes, Wyo. 851.
 virus, of mares, Ky. 851.
 Absorptive form lining, use and purchase specifications, 128.
Acacia melanoxylon, culture of isolated roots of, 853.
 Acariasis of fowl, dog, and man, 851.
Acaulopage n.spp., destructive to soil amoebae, 530.
 Acetaldehyde, role in red wines, 181.
 Acetone, heat of combustion, 166.
 Acetonemia in cattle, physiologic and metabolic aspects, 568.
Achlya—
 flagellata, new *Rozella* parasitizing, 808.
 sexual hormones in, 488.
Achromotrichia in rats—
 development, nutritive factors involved, Pa. 589.
 effect of pantothenic acid alone and in natural products, 150.
 Acids—
 amino, *see* Amino acid(s).
 fatty, *see* Fatty acids.
 organic, preservative values, Mass. 761.
Aconitum spp., somatic chromosomes of, 360.
Actinobacillus lignieresii from sheep in Montana, 715.
Actinomyces—
 inhibitory action on fungi in culture, 486.
 staining, in aerial parts of potato, 236.
Actinomycetes—
 bacteriolytic properties, 33.
 classifying, value of pigmentation in, 34.
 distribution of antagonistic properties, 34.
 in soil processes, importance, N.J. 342.
 variation in, 33.
 Actinomycin A, effect on bacteriophage and bacterial toxins and toxinlike substances, 710.
 Actinomycin, effect on soil fungi and bacteria, 161.
Adelphocoris superbus studies, N.Mex. 303.
 Adolescents in high-income families, hemoglobin and erythrocyte values, 742.
 Adrenaline extracts, effect on blood sugar in chicks, 790.
 Adsorption analysis, chromatographic, 627.
Aecidium liriocarpum, telial stage of, description, 530.
Aedes spp., vectors of equine encephalomyelitis, 117.
Aeoloplus turnbulli bruneri, epizootic among, 247.
Aeolothrips melaleucus, notes, 307.
Aeolus mellillus life history, Ky. 831.
Aerobacter—
 aerogenes, lethal effect of drier rolls on, 348.
 aerogenes, pathogenicity for turkeys and response to agglutination test for pullorum disease, 723.
 and *Escherichia*, tests for differentiation, [N.Y.]Cornell 33.
 Aerosol, definition, 247.
 Agar, nutritive value, 591.
 Agar, thiamin content, 39.
 Aged people—
 emerging problems of, 878.
 vitamin requirements, Mass. 880.
 Aggridant, use of term, Me. 183.
 Agricultural —
 Adjustment Act of 1938, amended, U.S.D.A. 437.
 Adjustment Administration—
 program, popularity, Pa. 586.
 reports, U.S.D.A. 202.
 and rural life programs, farmers' attitudes toward, S.C. 445.
 books, American, selected list, U.S.D.A. 880.
 changes since 1917 in Knox County, Tenn. 444.
 chemistry, *see* Chemistry.
 colleges, organization list, U.S.D.A. 880.
 conservation program, effects and implications, Kans. 202.
 conservation programs, W.Va. 731.
 cooperation in Maryland, status and trend, Md. 873.

Agricultural—Continued.

- cycles, specific, relation to prices, Iowa 283.
- economics, sources of information for, 283.
- economics, statistical methods applied to, 283.
- economy of Thailand, U.S.D.A. 435.
- economy, post-war, transitions to, 582.
- education for beginning farmers, nature and extent of need for, Iowa 302.
- education, part-time, effectiveness, Iowa 302.
- engineering, *see* Engineering.
- engineers, training, problems in, 302.
- equipment for different crops, studies, Mo. 129.
- experiment stations, *see* Experiment station(s).
- extension, *see* Extension.
- journals, new, 756.
- labor—
 - as factor in agricultural production in 1942 and 1943, Okla. 867.
 - hired, under wage and hours regulation, 582.
 - in the first World War, 582.
 - in United States, U.S.D.A. 288.
 - requirements, seasonal, for California crops, forecast of, Calif. 868.
 - studies, Ind. 730.
 - unions, recent development among, 583.
 - utilization, Mo. 129.
- land, criteria for rating, comparisons, 867.
- leadership, source in Adair County, Iowa 300.
- machinery—*see also* Combine(s) and Thresher.
 - distribution by farmers' cooperative associations, U.S.D.A. 206.
 - for harvesting bluegrass seed, 432.
 - important, varieties and use, 430.
 - life, service, and cost of service, Iowa 133.
 - new, available assistance in adaptation, N.J. 428.
 - requirements for farming with crop residue mulch, 122.
- planning in world at war, U.S.D.A. 285.
- policy and nutritional science, 582.
- policy for hemisphere defense, 583.
- preparedness, U.S.D.A. 285.
- prices, high, reflected in higher farm income, Miss. 730.
- prices, relation to specific agricultural cycles, Iowa 283.
- produce market, Boston regional, Mass. 866.
- production—
 - goals for 1942, revised, Okla. 130.
 - greater, as defensive weapon in war, P.R.U. 435.
 - in 1942 and 1943, farm labor as factor in, Okla. 867.

Agricultural—Continued.

- products—
 - cost of production, effect of size of farm and type of power, Ill. 583.
 - during World Wars I and II, prices of, behavior, 582.
 - home-grown, used on Michigan farms, Mich. 322.
 - marketing, *see* Marketing.
 - tables on prices, price indexes, and indexes of purchasing power, Okla. 866.
 - tariff rates on, U.S.D.A. 289.
 - programs—
 - adapting for war needs, 582.
 - and social conflicts, 583.
 - for post-war period, 582.
 - pursuits, attitudes toward, development of scales to measure, Iowa 302.
 - raw products research activities, 471.
 - readjustments, post-war, Latin American aspects, 582.
 - relief, *see* Relief.
 - resources of Iowa, effects of governmental programs on, Iowa 283.
 - situation—
 - and price tables and indexes, Okla. 730.
 - current, fundamental elements in, 583.
 - review, Okla. 435, 866.
 - tenancy, *see* Farm tenancy, Farm tenure, and Land tenure.
 - wastes, use for farm building insulation, Iowa 277.
 - watersheds, tillage practices for erosion control and runoff, Wash. 343.
 - workers and social insurance, 582.
- Agriculture—
- and foreign trade, [N.Y.]Cornell 130.
 - Department of, *see* United States Department of Agriculture.
 - electricity in, *see* Electricity.
 - Inter-American Conference of, research at, 757.
 - interregional competition in, research, U.S.D.A. 286.
 - joint costs in, economics, 583.
 - of Arizona, supplies, prices, and income, Ariz. 130.
 - of Cuba, U.S.D.A. 284.
 - of Eastern Russia, effect of war on, U.S.D.A. 285.
 - of Ecuador, 755.
 - of Jamaica, U.S.D.A. 285.
 - present crisis and effects of World War I, U.S.D.A. 285.
 - problems of, in Yakima Valley, Wash. 436.
 - relation to National Defense program, U.S.D.A. 285.
 - southern, benefits from farm machinery in, 279.
 - southern, in a changing world, Miss. 159.
 - use of light in, Idaho 725.
 - wartime, engineering in, 572.

Agriculture.—Continued.

- wartime, land, labor, machines as key factors, 573.
- Agriolimax agrestis* and its environment, 820.
- Agrotis obscurus*, life history and habits, 253.
- Agromyza simplex*, see Asparagus miner.
- Agronomic studies, planning experimental fields for, Iowa 183.
- Agropyron* sp. seed germination, 512.
- Agrostis tenuis*, growth, effect of vitamin B₁, 194.
- Agrotis orthogonia*, see Cutworm, pale western.
- Air conditioning for houses in California, Calif. 729.
- Air movement, effect of shelterbelts, Ind. 677.
- Air permeability instrument for testing textiles, 753.
- Alabama argillacea*, see Cotton leafworm.
- Albinism in turkeys, sex-linked, 303.
- Albumin, egg—
raw, injury-producing protein in, concentration and assay, 619.
watery and thick, composition, Wash. 404.
- Alcohol(s)—
bactericidal activities, effect of temperature, 486.
tolerance of yeasts, 35.
- Alcoholic fermentation, formic acid formation in, 181.
- Aldehydes, synthesis, from Grignard reagents, 4.
- Aleurites trisperma*, culture, P.R. 668.
- Alfalfa—
advantages of clipping or pasturing part of crop at 3 to 6 in. high, Wis. 504.
alone v. alfalfa-grass mixtures, Iowa 212.
and bromegrass pasture, merits of, Wis. 504.
and bromegrass v. bluegrass pastures for dairy cattle, Ind. 704.
and grass combinations, Ky. 792.
and grass mixture on irrigated land, value, Colo. 214.
and red clover mixtures, Ky. 792.
bacterial wilt, Ariz. 805.
black stem studies, 811.
borax studies with, Mass. 793.
breeding, Ariz. 791, Idaho 659, Nebr. 662, Wash. 867.
carotene and riboflavin in, 555.
composition, Tenn. 327.
culture tests, Wash. 367, Wyo. 793.
cutting experiments, N.Mex. 366.
fertilizer tests, Ariz. 791, Ind. 659, N.J. 366, N.Mex. 366.
hay, first-, second-, and third-crop, nutritive values, Nev. 835.
hay, hexose-phosphate in, 473.
hay v. alfalfa-molasses silage for steers, Ky. 884.

Alfalfa—Continued.

- hay, variability in mineral nutrient content, Colo. 834.
- insects, N.Dak. 248.
- irrigation duty-of-water studies, N.Mex. 429.
- land in continuous cultivation, plant succession on, effect of fertilizer, U.S.D.A. 485.
- leaf meal, dehydrated, improvements in processing, 160.
- leaf meal, effect on egg production and hatchability, 840.
- leaf meal, lipides isolated from, Mich. 168.
- leaf spot in Pennsylvania, U.S.D.A. 681.
- leafhopper resistance, relation to strains, Ill. 545.
- leaves, large and small, morphological analysis, 651.
- liberal feeding to pigs, high returns from, Wis. 555.
- management, [N.Y.] Cornell 53.
- molasses silage v. alfalfa hay for steers, Ky. 834.
- mosaic virus, celery mosaic caused by, 538.
- pasture for pigs, supplemental feeds for, N.Dak. 836.
- percolation and water requirement studies, Oreg. 860.
- phosphate fertilizer experiments, N.Mex. 368.
- pollen, collection by bees, U.S.D.A. 88.
- seed production studies, Ariz. 791.
- seedling infection by *Pythium debaryanum*, Iowa 681.
- silage, see Silage.
- snout beetle, pellet bait for control, 832.
- snout beetle, studies, [N.Y.] Cornell 90.
- use for silage, Ill. 562.
- v. lespedeza as green feed for chicks, Tenn. 404.
- variety tests, Idaho, 659, Me. 213, N.Mex. 366, Wash. 367, Wyo. 793.
- variety tests on bacterial wilt-infested soil, Iowa 212.
- weevil, studies, U.S.D.A. 88.
- wilt control, N.J. 378.
- wilt or wilting, 229.
- wireworm population, effect of crop rotation, Idaho 694.
- witches'-broom disease, cause, Wash. 378.
- yields and production costs, Mo. 52.
- Alkali soil(s)—
reclamation, Wash. 343.
survival of micro-organisms in, 28.
- Alkaline-calcareous soils, available phosphate in, determination, Ariz. 768.
- Alkalinity of southern Idaho soils, factors affecting, Idaho 632.
- Allergy, review of literature, 566.
- Allium* white rot in Louisiana, U.S.D.A. 527.
- Almond moth, notes, 551.

- Alstroemeria pelegrina* as greenhouse ornamental, [N.Y.] Cornell 64.
- Alternaria**—
defoliation of tomatoes, Conn. [New Haven] 805.
solanii infection of tomato seedlings, 386.
- Aluminum requirements of beef cattle, Fla. 833.
- Alyceclover—
adaptation trial as hay crop, S.C. 367.
fertilizer tests, Fla. 791.
production tests, Fla. 791, Tenn. 367.
value as maintenance ration for beef cattle, Miss. 699.
- Amazon fly, two strains, introduction, liberation, and recovery, P.R. 695.
- American—
Association of Economic Entomologists, common names of insects approved by, 246.
Dairy Science Association, meeting, 612.
- A. S. T. M. Standards, 1941 Supplement, tentative standards, 726.
- Amide nitrogen as source of protein for chicks, 702.
- Amino acetates, high-molecular-weight aliphatic, germicidal properties, 84.
- Amino acid(s)—
amide glutamine, method for preparing, commercial application, Conn. [New Haven] 760.
comparative growth studies on, 778.
composition and tests of nutritive value, 744.
determination by ninhydrin reaction, 177.
in oats and oat milling products, 138.
studies, Conn. [New Haven] 760.
synthesis, by chick embryo, 698.
utilization, for growth in mice, 698.
- p*-Aminobenzoic acid—
anti-gray hair activity in nutritional achromotrichia of mice, 600.
effect on graying of rat fur, 751.
- Ammonia titration in presence of boric acid, 172.
- Amphicoema vulpina*, notes, Mass. 820.
- Amphidiploidy, incidence and significance, 786.
- Amphimallus mafalis (rufescens)*, new to United States, 822.
- Amphorophora alleni* n.sp., description, 548.
- Amsinckia intermedia*, poisonous constituents, Wash. 418.
- Amyl acetate as clearing agent for embryonic material, 629.
- β -amylase, activity, effects of buffers on, 168.
- Amylases, dextrinizing and liquefying functions, 472.
- Anabrus simplex*, see Cricket, Mormon.
- Anaesthesia, veterinary, 564.
- Analysis, chemical, see Chemical.
- Analytical methods, referees' reports, 329.
- Anasa tristis*, formation of tracheal funnel, 402.
- Anastrepha**—
ludens, see Fruitfly, Mexican.
mombinpraeoptans, see Fruitfly, West Indian.
suspensa, adult populations in citrus plantings in Puerto Rico, P.R. 96.
- Andrena perplexa*, notes, Del. 245.
- Androgen(s)—
assay, chick comb for, 365.
urinary excretion by boars of different lines of breeding, 657.
- Androgenic substances, early effects in rat by aid of colchicine, 211.
- Androsterone, response to, in immature male rat, 789.
- Anemia(s)—
etiology, 455.
in ascorbic acid deficiency and response to iron, 154.
in dogs due to pyridoxine deficiency, 570.
infectious equine, transmission of, 718.
nutritional, in poultry, Mo. 98.
nutritional, relation to composition of home-grown foods, Fla. 880.
of flexed-tailed mice, 497.
of infancy, round table discussion, 156.
pigeon, due to vitamin deficiency, Mo. 145.
severity, effect on rate of hemoglobin production, 896.
- Aneurin, see Vitamin B₁.
- Angleshades moth, life history, 551.
- Anguillulina**—
dipsaci, giant race of, on broad beans, 533.
pratensis, host specialization, 390.
pratensis, life history, 543.
- Animal(s)—see also Cattle, Livestock, Mammals, Sheep, etc.
and man, relation to environment, Me. 303.
and plants, diploid cell and diploidisation process in, criticism and rebuttal, 495.
breeding—see also specific animals.
application of genetics to, 495.
problems, application of genetic principles, 208.
relation to environmental conditions, 47.
differences in form and behavior, genetic and endocrine basis, 211.
diseases—see also specific diseases.
diagnoses, Ind. 709.
relation to vitamin A, 710.
- domestic—
Babesia infections of, chemotherapeutic action of 4:4'-diamidino tlibene in, 109.
growth and development, Mo. 265.
parasites of, 109.
physiology, 49.
- farm, nutritive value of proteins from various sources and urea, [N.Y.] Cornell, 99.

Animal(s)—Continued.

- fats, see Fat(s).**
game, parasites of, relation to those of domestic animals, Wyo. 851.
heat production, base value, Pa. 99, 554.
husbandry experiments, design, 97.
mineral requirements and vitamins, 258.
nutrition—
 chemistry of, and Liebig, 616.
 relation to minor elements, 491.
 vitamins in relation to, 401.
parasites, see Parasites.
pathology, treatise, 564.
production of uniform experimental, in stock colony, Iowa 303.
reproduction in—
 physiology of, 789.
 role of endocrine secretions and nutrients in, 258.
shelters, ventilation, Mo. 433.
species, heat increment of gestation and birth weight in, relation, Mo. 99.
tissues, collagen and elastin in, determination, rapid method for, Iowa 256.
tissues, nicotinic acid in, quantitative estimation, 14.
Annona species, insecticidal properties, 825.
Anobium magnum, new borer damaging timber, 399.
Anomogyna elimata larvae, new descriptions, 400.
Anopheles—*see also* Malaria and Mosquito(es).
 complex in California, 89.
 culicifacies in borrow pits, ecology of larvae, 402.
 pseudopunctipennis, vector of malaria in Mexico, 255.
Anorthite, weathering, colloidal organic acids as factors, 25.
Ant(s)—
 Argentine, in Hawaii, 553.
 Argentine, introduced into Australia, 97.
 baits, Ill. 546.
 exotic, introduced into Australia, 97.
 parasite, new, 403.
 Pharaoh, thermal preference, guide in control, 97.
 white, see Termite(s).
Antelope—
 American, new coccidium from, 418.
 placentation of, 361.
Anthocyanins, chemistry of, 4.
Anthrenus—
 eugenii, *see* Pepper weevil.
 grandis, *see* Boll weevil.
 grandis thurberiae, *see* Thurberia weevil.
 signatus, *see* Strawberry weevil.
Antihrenus—
 scrophulariae, *see* Carpet beetle.
 verbasci, *see* Carpet beetle, varied.
 vorus, biology, [N.Y.] Cornell 94.

Antiseptics, effect on soil processes, N.J. 342.

Anuraphis—

- padi* control with dinitroresol, 396.
roseus, *see* Apple aphid, rosy.
Aonidiella (Chrysomphalus) aurantii, *see* Red scale, California.
Apanteles machaeralis, biology and morphology, 395.
Apatolestes species west of Mississippi River, 402.
Aphelenchoides ritzema-bosi in tomato fruit, 539.
Aphididae new to island of Midway, 547.

Aphids—

- Florida, biology and control, Fla. 822.
insecticide blends for, Wis. 516.
leaf and root, studies, U.S.D.A. 88.
population of potato crops in Ireland, relation to seed potato production, 399.
relation to spread of potato virus diseases, Me. 248.
spray mix for, Pa. 546.
taken on grass in Utah, 548.
woolly, *see* Apple aphid, woolly.

Aphis—

- (*Doralis*) *fabae* and *Aphis (Doralis) rumicis*, comparison, 548.
pomi, *see* Apple aphid.
rhmani, vector of potato virus Y, 829.
rumicis, *see* Bean aphid.

Aphrophora parallela, *see* Pine splitle bug.
Aplastomorpha calandrac, parasite on cigarette beetle larvae, 823.

Apparatus—

- for counting nematode eggs in feces, 392.
for cutting tissue sections, 359, 627.
for determination of organic acids in plant sap, 783.
for determining viability of embryonated helminth ova, 392.
for heavy water purification, pycnometer for, 474.
for measurement of bread crumb deformation, 475.
for microevaporations, 331.
for preparation of suspensions of feces for helminthological examinations, 392.
for production of artificial frost injury in plant tissues, 67.
for quantitative catalytic microhydrogenation, 170.
for simultaneous measurement of CO₂ and organic volatiles in internal atmosphere of fruits and vegetables, 57.
for sorption measurements under partial vacuum, description, 170.
for studying settling rate and fractionation of dusts, 68.
improved methoxyl, 475.
improved sublimation, 474.
laboratory spraying, for study of contact insecticides, 87.
molecular still heads, designs for, 474.

Apple(s)—

and raspberry juice, demonstration sale, 17.
 annual bearing, effect of blossom-spray and fruit-thinning practices, [N.Y.] Cornell 61.
 aphid control with dinitroresol, 396.
 aphid, rosy, control, Tenn. 393.
 aphid, rosy, outbreak, Ill. 546.
 aphid, woolly—
 biology and control, 93.
 infesting apple cores, 821.
 arsenical injury, control, 815.
 bacterial fire blight, Iowa 228.
 biennial bearing, control, Mo. 57.
 bitter rot control, copper sprays compared, Del. 227.
 blossom blight, tabulation, U.S.D.A. 805.
 blossom sprays for reducing and harvest sprays for increasing yields, 672.
 blotch control, Mo. 67.
 bordeaux cheapest and most dependable spray for, Ill. 528.
 branches, performance, relation to age, Mo. 57.
 breeding, Ill. 516, Iowa 220, Me. 220.
 byproducts, utilization, Wash. 327.
 capsid control and spray damage, 395.
 coloring with growth-promoting sprays, Wash. 372.
 cover sprays for, Del. 245.
 crab, *see* Crab apple.
 culture, better cultural practices in, N.J. 371.
 cuttings, use of growth substances for, Pa. 513.
 decay in storage in Georgian S. S. R., 529.
 deficiency symptoms, 80.
 diseases in North Carolina, U.S.D.A. 66.
 diseases in Ozark section of Arkansas, U.S.D.A. 66.
 early-maturing varieties, tests, Ky. 800.
 effect of modification of storage atmosphere, Iowa 220.
 fertilization, Ill. 516, Mo. 57.
 fire blight, U.S.D.A. 805.
 frost injury to, 767.
 fruit set, branch ringing for, Mo. 57.
 gas storage, 162.
 Golden Delicious, pruning, Ind. 668.
 growing, efficiency of spray protection on surface, Wash. 393.
 growing uniform stocks and development of new stocks, Iowa 220.
 growth and yield in central Washington, 516.
 Idared, new variety, Idaho 517.
 industry in Maine, survey, Me. 220.
 insects, bionomics and control, Iowa 247.
 insects, keys for identification, Pa. 824.
 irrigation experiments, Calif. 518.
 Jonathan, controlled atmosphere storage, 875.
 Jonathan, respiration studies, 61.
 juice and apple products research, Mass. 760.

Apple(s)—Continued.

juice, clarification, Wash. 327.
 juicers, Wash. 428.
 keeping quality—
 effect of careless handling, [N.Y.] Cornell 61.
 effect of low but nonfreezing temperatures, [N.Y.] Cornell 61.
 leaf(ves)—
 and fruits, retention of lead on, 827.
 curling midge, biology and control, Mass. 820.
 internal structure, effect of sprays, 61.
 transpiration and photosynthesis, effect of bordeaux mixture, 61.
 leafhopper, notes, Ind. 694.
 leafhopper, white, Del. 245.
 leafhopper, white, and orchard sprays, 828.
 maggot—
 control, Mass. 820.
 control, need of timing sprays for, N.Y. State 256.
 notes, Me. 248.
 of New York, N.Y. State 402.
 problem and trapping experiments, 553.
 mature, framework grafting, 670.
 McIntosh—
 bud sports of, Mass. 800.
 premature dropping, Mass. 800.
 respiratory metabolism during ontogeny, 61.
 sun coloring v. harvest sprays for improving color, Ohio 518.
 measles, cause, Ill. 528.
 new Close, descriptive account, Mich. 801.
 nonburning summer fungicides for, [N.Y.] Cornell 67.
 orchard(s)—
 production costs, Ill. 584.
 soil management, Ind. 668, Iowa 220, Ky. 799, Mass. 800, Pa. 513.
 spray costs, yields, and profits, Ill. 584.
 spray tests, 229.
 young, establishing and managing, U.S.D.A. 516.
 peel extracts as adjuvants to lead arsenate against codling moth larva, 829.
 pests, control by insecticides nonpoisonous to man, Wash. 394.
 polyploidy in, S.Dak. 513.
 practices to induce early and regular bearing, [N.Y.] Cornell 61.
 preharvest drop—
 control by spraying, Del. 220, Me. 220, N.Mex. 801.
 effect of culture and hormone sprays, [N.Y.] Cornell 61.
 prevention with growth-promoting sprays, Wash. 372.
 reducing with growth-promoting substances, N.Mex. 371.
 preharvest sprays for, Ohio 517.

Apple(s)—Continued.

- prices, changes in, [N.Y.]Cornell 134.
- production, regulating with sprays to remove flowers, 517.
- propagation, Del. 220
- rootstocks for, Pa. 513.
- rots, fungus causes and control, Wash. 378.
- rust control on red cedar, 79.
- rust, studies, 229.
- sales in New York City, 164.
- scab—
 - control, Mass. 807, Me. 228.
 - control, ground sprays for, 540, D.C. 227, Wis. 528.
 - control, prebloom sprays for, 540.
 - control, spray schedule for, Pa. 528.
 - control, spraying tests, N.J. 377.
 - development, 540.
 - development in Illinois, U.S.D.A. 66.
 - epidemiology and control, Mo. 67.
 - eradicant sprays for, Ind. 679.
 - fungicidal control, Conn.[New Haven] 805.
 - fungicides for, field testing, [N.Y.] Cornell 67.
 - fungus in Missouri, maturation of perithecia, U.S.D.A. 377.
 - groundwork for genetic studies, 44.
 - in Maryland, U.S.D.A. 680.
 - in New York, U.S.D.A. 377, 527.
 - in Pennsylvania, U.S.D.A. 377.
 - in Rhode Island, U.S.D.A. 680.
 - infections and spray procedures for prevention, 815.
 - new spray for, 531, U.S.D.A. 377.
 - spore discharge delayed in Maryland, U.S.D.A. 527.
 - studies, Iowa 228.
 - sulfur fungicides for, Del. 227, Ill. 528.
- scald and shrivelling, control methods. [N.Y.]Cornell 61.
- scald, factors affecting, 540.
- seedlings, relation of size to subsequent growth, Me. 220.
- soils, management, Del. 220, N.J. 483.
- spray injury on, Del. 227.
- spray residue removal, Ill. 516.
- sprays, notes, 547.
- spraying and dusting, Ind. 668.
- stock and scion relation, Iowa 220.
- stocks, hardy, propagating methods, Wash. 372.
- storage in modified atmospheres, Mass. 800.
- storage, methods of marketing, sales outlets, etc., Ill. 584.
- studies, 802, Mass. 860.
- sucker control with dinitroresol, 396.
- sulfur sprays, lime-sulfur v. mild sulfur, 672.
- supply and price relation, Wash. 435.
- susceptibility of blushed and green sides to fungus rots, 80.
- thinning, effects, 671.

Apple(s)—Continued.

- thinnings as source of codling moth infestation, 395.
- tree(s)—
 - biennial bearing, cause and control, U.S.D.A. 374.
 - chlorotic, treatment, Wyo. 801..
 - effect of sprays and heavy soil applications of borax, 671.
 - frameworked and topworked, comparison, 670.
 - mulch, use of sawdust as, Mass. 800.
 - pruning, thin wood method, Mich. 62.
 - rootstocks for, 671.
 - soil moisture availability, effect of soil management, Ill. 516.
 - training, Ill. 516.
 - winter-injured, wood rots of, Me. 228.
 - winter injury, Me. 220.
 - young, trunk diameter, effect of sulfur sprays, 517.
- varieties—
 - effect of clonal rootstocks on, Mass. 800.
 - improvement, N.J. 371.
 - light-setting, effect of ringing on fruit set in, Ohio 517.
 - low temperature resistance, comparison, Ill. 516.
 - old and new, Iowa 220.
 - studies, Del. 220.
 - variety, new, promising, Idaho 671.
 - vitamin C in, Wash. 447.
 - wormy, prevention, Mo. 393.
 - yields and sales, [N.Y.]Cornell 129.
- Apricot(s)—
 - bacterial gummosis, Idaho 679.
 - boron deficiency in, 62.
 - golden net virus disease, Colo. 601.
 - ring spot, studies, 81, Colo. 601.
 - Siberian, as ornamental, S.Dak. 513.
 - with sweet kernels, development, S.Dak. 513.
- Arachis seeds, bacterial diseases on, 529.
- Arabis determination, 753.
- Arbovitae wood structure, 66.
- Archips (Cacoccia) argyrospila*, see Fruit tree leaf roller.
- Arizona Station notes, 610.
- Arizona Station report 899.
- Arkansas Station notes, 466, 610, 900.
- Arkansas University notes, 466, 610, 900.
- Armillaria mellea*—
 - on sprout oak stands, U.S.D.A. 83.
 - on walnut, 243.
 - shoe-string-fungus rot on western hemlock, 543.
- Armyworm(s)—
 - fall, notes, P.R. 695.
 - fall, on corn, studies, P.R.U. 394.
 - food preferences and diseases, Ill. 546.
 - southern, blood cell changes induced by poisons, 253.

Arsenic—

- determination, method, 331.
- fixation in soils and effect on liberation of fixed phosphates, Mass. 769.
- in fresh-water fish, 740.

Arsenical sprays, substitutes for, Mo. 85.**Ascochyta—**

- imperfecta* on alfalfa, studies, 811.
- majalis* on lily-of-the-valley, 82.

Ascomycetes, dung-inhabiting, new fungus parasite on, 381.**Ascorbic acid—see also Vitamin C.**

- and sulfur dioxide in fruit juices, determination, 481.
- deficiency, anemia due to, response to iron, 154.
- determination in food containing SO₂, 481.
- determination, methods for, 15.
- effect on activity of gonadotropic hormone activity, 362.
- effect on vitamin K-deficient chicks, 560.
- in cowpea plants, factors affecting, 351.
- in dried vegetables, 751.
- in goat's milk, blood, and tissues, N.C. 706.
- in green snap beans, effect of freezing, canning, and dehydration, 891.
- in human blood, stability and transfer, effect of erythrocytes and leucocytes, 317.
- in human feces, 153.
- in milk, speed of oxidation, relation to oxidized flavor, 848.
- in muscadine grape varieties, 895.
- in onions and distribution, 151.
- in peas preserved by frozen-pack method, Wash. 458.
- in plants, photometric determination, 15.
- in quick-frozen vegetables, effect of composition of cooking utensil and volume of cooking water, 751.
- in raspberries preserved by frozen-pack method, 152.
- in raw wines, 894.
- in tomato plants, effect of potassium iodide, Ky. 800.
- in urines, determination, 623.
- in whole blood, determination, 624.
- injections in impotent bulls and cows, effect, 162.
- levels in plasma of children before and after dietetic adjustment, 152.
- losses from parsnips during cooking, 895.
- losses from snap beans before and after cooking and canning, Wyo. 880.
- metabolism of college students, Tenn. 446.
- metabolism of young men, Idaho 739.
- of blood plasma of cattle, effect of gonadotropic substance of pregnant mare serum, 360.

Ascorbic acid—Continued.

- of blood plasma, rate of increase after ingestion of vitamin C, Wash. 447.
- requirement of ambulatory patients, 153.
- system in barley, 351.

Ash—

- green, seedling growth, effect of subsoil acidity and fertility, 66.
- tree, *Fomes ignarius* on, development, 83.
- white, plantings on adverse sites, fertilizer tests, 677.

Asilidae, species, collected at Robson, B. C., 90.**Asparagus—**

- beetle studies, Wash. 394.
- breeding, N.J. 371.
- canned, average f. o. b. prices received for, Calif. 876.
- culture, Iowa 220.
- fertilizing methods, Ill. 514.
- improvement by selection, Mass. 800.
- miner studies, Wash. 394.
- rust control with eradicant sprays, 385
- yields, effect of severity of cutting, Ill. 514.

Asparagus-bean mosaic, seed-borne, 533.**Aspergillus—**

- flavus*, strain, antibacterial filtrates from, 33.
- niger*, amino acid formation from sugars in, process, 647.
- niger*, growth with amino acids, effect of trace elements, 379.
- niger* nitrite-induced injury-mutant, reversions to original strain, 647.
- niger*, response to trace elements, effect of carbon dioxide, 197.
- respiration, fermentation, and enzymes, 193.
- sp., new antibacterial agent produced by, 487.

Aspidiotus perniciosus, see San Jose scale.**Aspirator, improved Bates laboratory, description, U.S.D.A. 4.****Association of—**

- American Feed Control Officials, report, 100.
- Land-Grant Colleges and Universities, convention announcement, 160, 468.
- Land-Grant Colleges and Universities, proceedings, 445.
- Official Agricultural Chemists, annual meeting postponed, 324.
- Official Seed Analysts, meeting, 612.

Aster(s)—

- China, *Fusarium* wilt of, Ind. 679.
- leafhopper, control, [N.Y.] Cornell 90.
- leafhopper, studies, U.S.D.A. 88.
- leafhoppers, daily flight, 548.
- variety tests, Pa. 513.
- yellow in periwinkles, heat cure, 83.

Astragalus pectinatus, crystalline amino acid complex containing selenium and sulfur from, 200.**Astragalus, selenium indicator species, identification, 711.****Atmospheric haze, filters for penetrating, 679.****Attagenus piceus, see Carpet beetle, black.**

Autographa spp., larvae, new descriptions, 400.

Auxin(s)—

- determination in plants, 351.
- in American soils, 344.
- in plant materials, isolation and identification, 778.
- in soils, extraction and assay, 186.
- interactions in growth and inhibition, 778.
- pea test for, nastic and traumatic causes of curvatures in, 488.
- transport in inverted Tagetes cuttings, polarity, 38.

Avena—

- fatua* injured seeds, viability, 512.
- sp., inoculations with races and collections of *Ustilago* spp., Wash. 378.

Avidin in raw egg white, concentration and assay, 619.

Avocado(s)—

- and oak root fungus, 241.
- culture, Fla., 799.
- diseases, Fla. 806.
- Fuente, climacteric rise in respiration rate, 521.
- selection and propagation, P.R.U. 221.
- sun blotch, nature and control, 241.
- trees, young, root distribution on bench terraces, 674.
- trunk cankers, 241.

Axonopus compressus seed germination, effect of different temperatures, 512.

Azalea(s)—

- culture, N.J. 371.
- diseases, new, in Gulf coast area, 245.
- flower spot fungus, Spanish moss mulch for control, 243.
- flower spot spread, relation to insects, U.S.D.A. 243.
- Orullinia* flower spot, Fla. 806.

Azotobacter—

- activity in New Jersey soils, lack of, N.J. 342.
- agile*, growth, effect of copper and iodine, 491.
- cells, large scale production, 33.
- chroococcum*, inoculation of soil with, 637.
- cultures, hydrogenase in, 195.
- growth in soil, factors affecting, 52.
- hydrogenase in, properties, 33.

Babcock test, review of literature, 707.

Babesia—

- canis* infection of dogs, treatment with 4:4'-diamidino diphenoxy propane, 118.
- infections of domestic animals, chemotherapeutic action of 4:4'-diamidino stilbene in, 109.

Baby beef, *see* Cattle, baby beef.

Bacilli—

- aerobic sporulating, bactericidal substances, 84.
- grown on three types of peptone, variability in acid and alkali production, 83.

Bacillus—

abortus, *see* *Brucella abortus* and Bang's disease.

albolactis in Virginia milk, effect on quality, 413.

anthracis, longevity of dry spores, 418.

coli, effect of sulfonamide derivatives, 564.

macerans, amylases produced by, preparation and properties, 485.

mycoides, lethal effect of drier rolls on, 348.

polymyza, amylases produced by, preparation and properties, 485.

Bacon pig, nutrition of, 406.

Bacteria—

aerobic mesophilic, fermentation of cellulose by, 636.

aerobic, vegetative and spore cells, spectrochemical analysis, 33.

aging without reproduction and viability of young cells, 776.

and fungi, antibiosis between studies, 486.

autotrophic sulfur, growth substances in cells of, 33.

cryophilic, cause of milk samples failing the methylene blue test, 847.

dehydrogenase systems of, [N.Y.]Cornell 33.

destruction of germicides, effect of vacuum, 34.

effect of carbon dioxide on, Mich. 258.

gram-negative, new bactericidal agent active against, 348.

green - fluorescent - pigment - producing, [N.Y.]Cornell 33.

heterotrophic, assimilation of heavy carbon dioxide by, 348.

in creamery well water, N.Dak. 707.

in milk and soil, *see* Milk and Soil(s).

in mucous membranes and viscera of rats, effect of chronic vitamin A deficiency, 599.

in well waters, 106.

lethal effect of drier rolls on, 181, 348.

metabolism of, 35.

mutation in, 44.

nitrogen and accessory growth factor requirements, Iowa 191.

nuclear apparatus of, 349.

phytopathogenic—

lipolytic activity determined by spirit blue agar and its taxonomic significance, 809.

nomenclature, classification, and physiology, [N.Y.]Cornell 67.

sporiferous, variability, [N.Y.]Cornell 83.

staining reactions, 630.

staining with acid dyes, 630.

utilization of hydrocarbons by, 83.

Bacterial—

metabolism, aldolase and isomerase equilibria in, 35.

nucleus, demonstration of, [N.Y.]Cornell, 33.

Bacterial—Continued.

- spores in fluids, killing by agitation with small abrasives, 192.
- Bacteriological culture media, *see* Culture media.
- Bacteriological technic, report of committee on, 34.
- Bacteriologists, Society of American, local branches, proceedings, 229.
- Bacteriology textbook, 418.
- Bacteriophages—
 - for staphylococci of mastitis, 421.
 - identification and characterization with electron microscope, 643.
- Bacteriostasis, mechanism, relation to *p*-aminobenzoic acid, 271.

Bacterium—

- citri*, *see* Citrus canker.
- coli*, *see* *Escherichia coli*.
- papavericola* on poppy in Oregon, U.S. D.A. 805.
- purificiens*, notes, 716.
- Balcones escarpment, floral distribution, 32.
- Baler, pick-up, and haymaker, [N.Y.]Cornell 120.
- Balsamroot, arrowleaf, feeding value, effect of stage of maturity, Idaho 616.

Bamboo(s)—

- new, from Venezuela and Colombia, 777.
- powder-post beetle, biological studies and control, P.R. 695.
- propagation and utilization, P.R. 608.
- scale predators, redistribution to new localities, P.R. 695.
- scales, coccinellids predatory on, collection in Trinidad and Brazil, 89.
- scales, lady beetles effective against, P.R. 695.
- wood, moisture in, reduction with experimental solar drier, P.R. 725.

Banana—

- carbohydrate metabolism during storage and ripening, 63.
- cercospora* leaf disease control, 241.
- Chitocylbe* root rot, 542.
- virus disease, 81.

Bang's disease—*see also* Brucellosis.

- calfood vaccination against, 421, 567.
- control, Utah 713.
- in Ontario, control by area plan, 566.
- studies, Ill. 564, N.J. 418.
- tests, tube agglutination and rapid or plate, Mo. 108.
- transmission from swine to cattle, Mo. 108.

Barberry eradication for wheat stem rust control, U.S.D.A. 66.**Barium adsorption by soils and minerals, relation to pH, 642.****Bark beetle(s)—**

- and apple trees, relation to Dutch elm disease control program, 550.
- of Washington, 400.
- surveys and control, U.S.D.A. 88.

Barley—

- activity and quality (Q_{10} and μ) of catalase in, 489.

Barley—Continued.

- adaptation to lowland soils and production methods, Mo. 213.
- ascorbic acid system in, 351.
- and air movement in, Ind. 725.
- breeding, Idaho 659, 679, Iowa 212, Mo. 52, N.J. 366, N.Mex. 366, [N.Y.]Cornell 53, S.Dak. 504, Tenn. 367, Wash. 367.
- culture tests, Tenn. 367, Wyo. 793.
- development, effect of photoperiod and temperature, 40.
- fertility in lateral spikelets, inheritance, 786.
- for fattening cattle, Mo. 99.
- growth and yield, effect of diseases, Idaho 679.
- harvesting, combine v. binder-separator, Mich. 795.
- insects bred from, 394.
- lespedeza v. soybeans sown in, Tenn. 367.
- loose smut resistance, inheritance of, 532.
- male-sterile, for study of floral infection, 382.
- malts, starch degrading properties, 472.
- manganese deficiency control by spraying, 229.
- mechanical injury in threshing, 578.
- mechanical injury to, prevention, S.Dak. 573.
- roots, absorption and excretion of K and Ca in culture media, Mass. 792.
- root cells, accumulation of monovalent ions by, effects of Cu and other divalent ions, 646.
- roots, excised, metabolism of organic acids in, 491.
- rotation studies, Va. 793.
- seed weight, effect of flower mutilation, Ill. 504.
- seedling root tips, photodynamic action of neutral red on, 493.
- seedlings, respiration, relation to oxygen supply, 31.
- smut, nonpathogenic buff-colored, 811.
- smut resistance, variety tests for, 229.
- smut, seed treatment for, Mo. 67.
- spring, in Illinois, Ill. 368.
- spring, place in New Jersey farming, N.J. 366.
- straw, digestibility and feeding value for horses, effect of Beckmann's treatment, 407.
- time of planting tests, Me. 213.
- Ustilago nuda* in, resistance inheritance to, Mo. 67.
- varieties, Mo. 214.
- variety tests, Del. 212, Idaho 659, Ill. 504, Iowa 212, Mo. 52, N.J. 366, N.Mex. 366, Pa. 504, S.C. 367, S.Dak. 504, Tenn. 367, Wash. 367, Wyo. 793.
- winter, feeding value for pigs, N.J. 403.
- winter, preferred breeding ground for chinch bugs, Ill. 546.
- yield and composition, Ariz. 841.
- yield and production costs, Mo. 53.

Barn(s)—

- construction, factors in, N.J. 410.
- dairy, concrete, temperature, humidity, dairy, insulation, prevention of condensation loading, N.J. 428.
- pen, methods of building, Wis. 574.

Bases, exchangeable, determination, Tenn. 343.

Basiporum gallarum pathogenicity to corn, Iowa 228.

Bassus stigmaterus, parasite of sugarcane borer in Florida, 95.

Bat infestations in human dwellings in Brazil and *Ornithodoros tulaje*, 403.

Bat, Jamaican, placentation of, 499.

Bay leaves, distilling, use of salt in, 180.

Bay oil, yield and quality, increase, and properties, P.R. 617.

Beam, curved, stresses in under loads normal to plane of axis, 576.

Bean(s)—*see also* Mung bean(s) and Soybean(s).

- anthracnose resistance, factorial interpretation, U.S.D.A. 682.

- anthracnose severe in Virginia, U.S.D.A. 805.

- anthracnose, varietal susceptibility, 529.

- aphid, description and comparison with

- Aphis (Doralis) fabae*, 548.

- bacterial blight, N.J. 815.

- beetle, Mexican—

- control, [N.Y.] Cornell 90.

- feeding of larva, 399.

- studies, Me. 248.

- breeding, P.R.U. 213.

- disease, new virus 4, 382.

- effect of aphids on chemical composition, 94.

- experiments with, [N.Y.] Cornell 507.

- Great Northern, *Sclerotinia* on, U.S.D.A. 377.

- green snap, vitamins in, effect of freezing, canning, and dehydration, 891.

- halo blight, physiological resistance to, 72.

- inheritance in, Tenn. 371.

- leaf roller, Fla. 822.

- leafhopper, Fla. 822.

- leaves, areas of, nomogram for finding, 785.

- lima—

- “baby” bush, for canning, performance trials, 58.

- downy mildew, in Colorado, 385.

- effects of boron on, Del. 212.

- for quick freezing, best program for growing, N.J. 434.

- freezing preservation, adaptation of new varieties for, Ill. 514.

- immature, protein and sulfur in, 447.

- seed treatments recommended for, N.Y.State 222.

- spraying with naphthaleneacetic acid, Ky. 800.

- varieties, Fla. 799.

Bean(s)—Continued.

lima—continued.

- variety tests, S.C. 371.

- vitamin C in, Wash. 447.

- manganese-deficiency disease on burned peat soil Wis. 528.

pinto—

- breeding, N.Mex. 366.

- effect on hemoglobin regeneration in nutritional anemia, N.Mex. 446.

- improvements by New Mexico Station, 2.

- iron and copper contents, N.Mex. 446.

- plant, response to α -naphthaleneacetamide and phenylacetic acid, 39.

- plant, responses to chlorate and perchlorate ions, 233.

- powdery mildew resistance, breeding for, Fla. 806.

- reduced germination in, N.Y.State 222.

- resistant crosses and selections, Idaho 679.

- rust resistance, breeding for, Fla. 806, Wash. 378.

- seed treatment, Mass. 800.

- snap, yield and grade, effect of planting rate and harvest interval, Me. 220.

- split seeds in, 512.

- storage experiments, P.R.U. 213.

- string, dried, ascorbic acid in, 751.

- U. S. No. 5 Refugee, hardness and productivity, U.S.D.A. 373.

- vapo-dusting, Fla. 806.

- variety tests, N.Mex. 366.

- yield, effect of fertilizer placement, S.C. 371.

Beehives, electric heating, value, 833.

Bee(s)—

- culture and disease resistance, Wyo. 822.

- effect of grasshopper baits on, U.S.D.A. 88.

- eggs and larvae, effect of sunlight on, U.S.D.A. 88.

- foulbrood, *see* Foulbrood.

- Italian strain, breeding, U.S.D.A. 88.

- mining, notes, Del. 245.

- North American, distributional history, 89.

- package, N.J. 696.

- poisoning, 553.

- preparing for winter, N.J. 696.

- resistance to American foulbrood, 553.

- selection for increased honey production, U.S.D.A. 88.

- visiting red clover, frequency and environmental conditions, 96.

Beef—*see also* Cattle, beef.

- aged, effect of freezing on tenderness in, 98.

- changes during freezing and storage, Ind. 697.

- color, relation to feed and management practices, 98.

- effect of temperature on grades held in storage, Iowa 257.

Beef—Continued.

from grass-fattened and grain-fattened steers, comparative ripening, 556.
frozen, studies, Ind. 740.
nicotinic acid in, 150.
palatability, effect of storage conditions, 140.

production—

at Holly Springs Branch Station, Miss. 159.
feeding experiments for, Ariz. 835.
grain v. grass in, 98.
with minimum grain and maximum roughage, Mo. 99.
quality, effect of exercise, Ill. 700.
rate and cost of gains and quality, effect of ration, S.C. 403.

Beet(s)—

application of borax to, Wis. 513.
boron deficiency in, borax spray or dust for control, Wis. 528.
color and sugar content, effect of environment, Conn. (New Haven) 799.
cross- and self-sterility and self-fertility in, inheritance, 652.
culture tests, Fla. 799.
effect of secondary ions in nitrate fertilizers, 29.
equilibrium of ions in, 642.
fertilizers for, Wis. 513.
leafhopper, ecology and control, U.S.D.A. 88.
leafhopper, life history, bionomics, and control, U.S.D.A. 398.
mechanized production, Idaho 725.
pulp, wet, v. silage for steers, Wyo. 834.
seed treatments recommended for, N.Y. State 222.
sugar, *see* Sugar beet(s).
variety tests, Fla. 799.

Beetles as rose pests, 252.

Beggarweed rotation studies, Fla. 792.

Begonia—

fibrous-rooted, *Pythium* spp. on, 817, Mo. 67.

tuberous, stem rot of, 388.

Belladonna seed, laboratory germination, 512.

Benne *Cercospora sesami* blight, control, S.C. 378.

Bentgrass—

colonial, development, effect of soil temperature, 196.
creeping, breeding, Pa. 504.
disease resistance, Pa. 504.

Bentonite, secondary clarification with, 338.

Benzene derivatives as screwworm larvicides and wound protectors, 255.

Benzimidazoles, 2-(aldo-polyhydroxyalkyl), preparation, 167.

Bermuda grass, response to temperature variations, Mo. 53.

Berries, *see* Fruits, small, and Raspberry(ies), Strawberry(ies), *etc.*

Bibliofilm Service, U. S. D. A. Library, 324.

Bibliography of—

avian malaria, 419.
botany of Argentina, 194.
botany of Virgin Islands, 80.
dairy industry in United States, U.S.D.A. 436.
dehydrated foods, nutritive value, N.Y. State 450.
earthworms, North American, 86.
egg storage, U.S.D.A. 703.
farm tenancy in United States, U.S.D.A. 585.
fur animals of North America, 391.
grasshopper control, evaluation of bait material, U.S.D.A. 250.
hellebore alkaloids, toxicity to American cockroach, 249.
helminths, natural resistance to, 110.
Heterosporium genus, 487.
insects, temperature preference of, 91.
marketing fruits, vegetables, and nuts, U.S.D.A. 440.
metals in foods and biological materials, 453.
milk secretion, 105.
minor elements, relation to nutrition, 491.
nucleoli and related nuclear structures, 494.
palms, development, 494.
Phytomonas n.spp., 69.
plant products, 87.
poultry disease, 118.
poultry tapeworms, removal by short periods of starvation, 571.
Siphonaptera of North America, 553.
soil conservation, economic and social aspects, U.S.D.A. 300.
soil conservation publications, Okla. 344.
soybean protein, U.S.D.A. 618.
sugars, thermophile bacteria in, 485.
tax delinquency on rural real estate, U.S.D.A. 288.
tomato plant culture under artificial light, 784.
vitamin K, 461.
vitamins in dermatology, 600.
wood decay, 390.

Bilberry, vitamin C in, 605.

Bindweed—

control, Ariz. 791, N.Dak. 57, S.Dak. 504.
control, effect of time of cultivation, U.S.D.A. 485.
control, interval of cultivation for, 32.
development and chemical control, Ill. 504.
European, tetrachlorethane for eradication, 191.
roots, antihemorrhagic material in, 646.
seeds, viability and germination, 512, Iowa 55.

Bioclimatology, spectral range of ultraviolet solar radiation useful in, 181.

Biological symposia, 454.

Biology teaching in secondary schools, 136.

Bios components, comparative growth studies on, 778.

Biotin—

- activity, effect of certain reagents, 625.
- as growth factor for *Rhizobia*, 352.
- concentrates, cure of spectacle eye condition in rats with, 599.
- free and bound, occurrence, 624.
- free crystalline, preparation, 625.
- functional groups, characterization, 625.
- in chick nutrition, 409.
- intestinal synthesis and growth of rats on low-biotin diet, 698.
- isolation from liver, 624.
- isolation from milk, 625.
- microbiological assay for, 626.
- relation to perosis in chicks, Mo. 839.

Bird(s)—

- adaptive modifications for tree-trunk foraging, 545.
- and codling moth control in Ozarks, 254.
- game, artificial propagation, Mo. 85.
- of North America, life histories, 545.
- of North America, taxonomy and distribution, [N.Y.]Cornell 86.
- of Wisconsin and Michigan, schistosomes from, 86.
- on northern boundary of New York State, ecology and economics, 86.
- ovaries, post-ovulatory follicle in, regression, 657.
- records, new, for Virgin Islands, P.R.U. 391.
- ticks affecting eyesight, 246.
- trichomoniasis in, studies, 421.

Biscuit waste as supplement for pigs, 406.

Black scale parasites, introduction from California, P.R. 695.

Blackberry—

- culture, N.Y.State, 376, U.S.D.A. 519.
- culture, decline in State, causes, N.Y. State 802.
- insects, life history and control, Wash. 92.

Black-eyed bug, predatory on pea aphids, 398.

Blackhead in turkeys, Mo. 108.

Blackhead of turkeys, sulfanilamide therapy in, 119.

***Blattella germanica*, see Cockroach, German.**

***Blennocampa rubi*, notes, Del. 245.**

***Blepyrus* n.s.p., description, 402.**

***Blissus leucopterus*, see Chinch bug.**

Blister beetle research, S.Dak. 546.

Blizzard of November 1940 in Iowa, effect on fruit trees, 767.

Bloat colic in horses, notes, P.R.U. 270.

Bloat in cattle, Calif. 413, S.Dak. 564.

Blood—

- ascorbic acid in, determination, 624.
- avian, bactericidal agents, Ind. 709.
- building in dogs, effects of cobalt and liver substance, 718.
- centrifuged oxalated, ascorbic acid-like reducing substance in buffy layer, 317.
- copper in sheep and cows, 115.

Blood—Continued.

human, ascorbic acid in, effect of erythrocytes and leucocytes, 317.

human, clotting in, effect of substance from bindweed, 646.

human, thiamin in, determination, 602.

meal ration, effect on porphyrin excretion in bovines, 851.

nicotinamide in, bacterial assay method, 480.

nicotinic acid in, 893.

of school children, hemoglobin and vitamin in, S.C. 455.

pantothenic acid in, determination, 338.

pressure of Europeans, effect of tropical environment, 307.

pyruvate in vitamin B₁ deficiency, 315.

regeneration, see Hemoglobin.

review of literature on, 454.

sulfanilamide determination in, new simple method, 338.

Blowflies, seasonal abundance and distribution in Arizona, 255.

Blue grama on southwestern ranges, characteristics and value as range forage and soil binder, U.S.D.A. 506.

Blueberry (ies)—

breeding, Wash. 372.

breeding and selection, Me. 220.

byproducts development, Me. 220.

culture, Mass. 800.

cuttings, hardwood, rooting problems, 521.

fields, burning and control of weeds, Me. 220.

fruitfulness, relation to bees, Me. 220.

highbush, growth and productivity, Mich. 802.

highbush, nutrition, Mass. 800.

in New York, N.Y.State 802.

maggot, notes, Me. 248.

making soils acid for, N.Y.State 224.

pruning, N.J., 371.

soil and water requirements, N.J. 371.

stunt, a virus disease, U.S.D.A. 527.

thrips, notes, 828, Me. 248.

varieties, identification by leaf characters, N.J. 371.

Bluegrass (es)—

and legumes v. bluegrass alone, Ky. 792.

Kentucky—

and Canada, response to temperature variations, Mo. 53.

development, effect of soil temperature, 196.

eyespot, cause, 682.

freshly harvested seed, germination, 512.

replacing redtop as dominant growth in pastures, Wis. 504.

tests, Ky. 792.

uptake of manganese by, 346.

variation in, as criteria for apomictic seed formation, 206.

leaf spot in Pennsylvania, U.S.D.A. 681.

**Bluegrass (es)—Continued.
pasture(s)—**

- composition and production, effect of fertilization, Ind. 659.
- continuous and rotational grazing by ewes and lambs, Ky. 834.
- continuous v. rotational grazing with dairy heifers, Ky. 842.
- grazing method effect on live-weight gains by beef cattle, Mo. 53.
- v. alfalfa-bromegrass for dairy cattle, Ind. 704.
- yields and production costs, Mo. 53.
- seed development, effect of soil N level on, Ky. 792.
- seed, harvesting, machinery for, 432.
- seed setting, effect of meadow plant bug, Ky. 822.

Bobwhite, see Quail.**Body size and metabolism, relation, 657.****Boll weevil—**

- biology and control, U.S.D.A. 88.
- hibernation, survival, and emergence, S.C. 393.

Bollworm(s)—

- pink and spotted, parasites of, 401.
- pink, control, U.S.D.A. 254.
- pink, studies, U.S.D.A. 88.
- studies, N. Mex. 393, U.S.D.A. 88.

Bone(s)—

- and cartilage, adult or embryonic, differentiating, alizarin red S and toluidine blue for, 629.
- development, manganese, phosphatase, and vitamin D in, interrelation, 560.
- fluorine in, retention and elimination, 747.
- fractures due to low calcium diets, 595.
- histology of male rats thyroparathyroidectomized when one month of age, 503.
- potassium in, spectrochemical studies, 462.

Books on—

- agricultural economics, sources of information for, 283.
- agricultural economics, statistical methods applied to, 283.
- animal pathology, 564.
- animals, domestic, physiology, 49.
- bacteriology, 418.
- dairy engineering, 728.
- dairying, 841.
- drainage, 575.
- farm shop practice, 445, 446.
- flood-control engineering, 575.
- floriculture, 523.
- food values in shares and weights, 740.
- house repairs, 729.
- milk secretion, 105.
- nutrition in health and disease, 306.
- pigeons, 562.
- plant science formulae, 191.
- poultry science and practice, 102.
- textile fabrics and their selection, 752.
- wiring, 866.

Boophilus decoloratus* resistance to arsenic, 272.*Borers, coleopterous, in shade trees, increasing importance, 830.****Boron—**

- absorption and excretion by man, 748.
- as minor plant nutrient, 197.
- distribution among plant species, 354.
- distribution in soils and related data, U.S.D.A. 100.
- in soils, determination, 174.
- requirements of crops, 346.
- response of squash to, 354.
- toxicity to crops, Ariz. 805.

Botanical—

- bibliography of Argentina, additions, 194.
- literature, Danish, bibliographies, 776.
- notes of Kansas, U.S.D.A. 485.

Botany—

- advances in, 191.
- Canada's contribution to, 30.
- historical viewpoint for, 485.
- of Virgin Islands, 30.
- textbook, 776.

Botrytis vulgaris*-type fungus causing pepper rot, 539.**Bouteloua* somatic chromosome complements in, 208.*****Brachymeria* n.spp., descriptions, 402.*****Brachyrhinus*—**

- ligustici*, see Alfalfa snout beetle.
- singularis* in British Columbia, 90.

Bramble(s)—

- mosaic on, Wash. 378.
- vitamin C in, 605.

Brassica alba*, growth, effect of vitamin B₁, 194.*Brassicac club root control experiments, 385.****Brazil nuts, organisms causing rots, 82.****Bread—see also Flour.**

- baking quality and nutritive properties, effect of dried skim milk and dried whey on, 304.
- crumb deformation measurement, apparatus for, 475.
- economy of household production, Iowa 321.
- enriched, or nutritionally improved, 450.
- moisture content, comparison with other foods, Wash. 447.
- nicotinic acid in, determination, 13, 622.
- retardation of staling by freezing, 590.
- riboflavin in, 750.
- thiamin in, 604.

whole-wheat—

- and white, apparent digestibility of carbohydrates, fats, and indigestible residue, 884.
- provitamin A in, 145.
- v. white, digestibility and biological value, 883.

Brennania* n.n. west of Mississippi River, 402.*Broad mite control, Ill. 546.****Broccoli, calcium of, utilization, 143.**

Bromegrass—

- and alfalfa pasture, merits of, Wis. 504.
- bacterial halo blight, Iowa 228.
- breeding, Iowa 212.
- crested, singly and mixed, feed efficiency, Wash. 404.
- culture tests, Wyo. 793.
- effect of selfing on seed setting, Iowa 212.
- mosaic, 234.

Bromelin, properties and commercial production, 167.

Bromus—

- carinatus*, breeding structure, 31.
- tectorum* seed, injured, viability, 512.

Bronchitis, infectious—

- in baby chicks, 275.
- studies, Mass. 858.

Bronco grass on Nevada ranges, Nev. 662.

Brooders, pig and lamb, electric, 278.

Brotholomia reticulosa, life history, 551.

Brown-tail moth, control, U.S.D.A. 88.

Browntopmillet, grazing value, Tenn. 367.

Browse gathered at varying stages of maturity, composition, N.Mex. 327.

Brucella—

- abortus**—see also Bang's disease.
- and its agglutinin in colostrum and milk, examination, 567.
- changes produced by in milk and udder of cows, 853.
- effect of sulfanilylguanidine in vitro, 710.
- sonic filtrate, allergic and antigenic activity, 710.
- (strain 19) in mature cattle, Ind. 710.

group, accessory growth factor requirements of strains, 109.

suis infection in pigs, genetic resistance to, 656.

Brucellosis—

- eradication, two methods, Tex. 272.
- in swine, Idaho 709, Ind. 710.
- in swine, genetic resistance to, 209.

Bruchus pisorum, see Pea weevil.

Buckhorn, cytological-histological study, 785.

Budgeting, county, effectiveness in terms of living within available resources, 867.

Buffalo grass—

- in Kansas, improvement, 792.
- pretreatment for field planting, 512.

Buffalo treehopper on apple and cherry trees, Wis. 546.

Bulb(s)—

- damage by field mice and moles, N.J. 391.
- flies, studies, U.S.D.A. 88.
- flowering, diseases, [N.Y.]Cornell 67.

Bull(s)—see also Sires.

- dairy, cost of keeping, Ind. 730.
- dairy, transmitting ability, N.J. 360.
- dairy, variations in semen samples and relation of exercise to amount and quality, N.J. 360.
- fertility in, factors affecting, Ind. 656.

Bull(s)—Continued.

- reproductive organs and semen production, Ind. 656.
- semen storage, Mo. 47.
- semen yields of successive ejaculates, N.J. 360.
- spermatozoa, chemical studies, 657.
- stud, associations for service to small herds, Idaho 703.
- young, semen production, effect of rations, 209.

Bumblebees, notes, N.Dak. 248.

Bunostomum trigonocephalum in sheep on irrigated pastures, Oreg. 856.

Bunt, see Wheat smut, stinking.

Bur-clover cultivation and utilization, U.S.D.A. 369.

Bureau of Entomology and Plant Quarantine, report, U.S.D.A. 87.

Burweed food reserves, relation to control practices, Ariz. 791.

Bushes, killing, ammonium sulfamate for, Mass. 800.

Butter—

- acids in and their distribution between water and fat phases, Iowa 263.
- and cheese cultures, mechanism of dissimulation of carbon sources in, Iowa 263.

bacterial growth in, factors affecting, 269.

cultures development from mixtures of organisms, Iowa 263.

cultures, preparing for mail shipment, Iowa 263.

detection of formalin adulteration in milk used for, 849.

deterioration during storage, 415.

distribution of diacetyl and acetylmethylcarbinol between fat and water in, 268.

distribution of salt in, 762, Iowa 263.

effect of temperature, Mo. 103.

fat and serum phases of, distribution of diacetyl and acetylmethylcarbinol between, Iowa 263.

flavors imparted to, by French weed, wild onion, and peppergrass, S.Dak. 563.

for packaging, manufacturing methods, Iowa 264.

grades and characteristics, consumer preference for, Ind. 704.

Indiana, quality, Ind. 704.

keeping quality in cold storage, Ill. 562.

lipolysis in, effect of storage temperature, 414.

making, Canadian creamery, 107.

making, quality of cream for, salt for improving, 269.

mold mycelia in, value of producer interviews in reducing, 107.

of Philippines, locally produced and imported, comparison, 107.

oil, studies, [N.Y.]Cornell 4.

Butter—Continued.

- phosphatase reaction, effect of storage conditions, Ind. 87.
- quality, effect of cream-holding methods, S.Dak. 563.
- quality, effect of neutralizers, Iowa 264.
- retail, quality in Michigan, Mich. 850.
- stored for six years, keeping quality, factors affecting, 269.
- surface taint in, relation to *Pseudomonas putrefaciens*, Iowa 263.
- sweet cream, keeping quality, effect of pH of serum, Iowa 264.
- unsalted, manufacture, diacetyl and acetylmethylcarbinol production in, Iowa 849.
- vitamin A in, controlled by feeding, 105
- "wintry" flavor in, factors affecting, Idaho 703.

Butterfat—

- accounting for, 104.
- costs per pound in dairy herds, N.J. 434
- fatty acid fractions, effect of hydrogenation on nutritive value, 137.
- fractions, carotenoid content, 707.
- globules, physicochemical properties of surface, [N.Y.]Cornell 104.
- losses during churning, reducing, Oreg 849.
- losses in Iowa creameries, determination, Iowa 264.
- prices paid for, in various large cities, Idaho 729.
- secretion, effect of fat level and sources in ration, [N.Y.]Cornell 104.
- vitamin A in, Ind. 616.
- volume hauled per mile, relation to cost of hauling, Ill. 584.

Buttermilk—

- dried, replacement by soybean meal for battery laying hens, N.Mex. 403.
- fat losses in, effect of neutralizers, Iowa 264.
- fat losses in, reducing, Oreg. 849.

Bythurus*, see Raspberry fruitworm.*Cabbage—**

- breeding, Del. 220, [N.Y.]Cornell 57.
- club root control, N.J. 378, 815, [N.Y.] Cornell 87.
- damping-off, seed treatments for, Fla. 808.
- disease control, new development, 18.
- disease-resistant, breeding, Ill. 514.
- dried, ascorbic acid in, 751.
- dusting and spraying for downy mildew and black rot, Fla. 806.
- effect of aphids on chemical composition, 94.
- insects, dust for control, Wis. 546.
- maggot control, Mass. 820.
- Maine-grown varieties, ascorbic acid in, 606.
- manganese-deficiency disease on burned peat soil, Wis. 528.
- production studies, Fla. 799.

Cabbage—Continued.

- seed treatments recommended for, N.Y. State 222.
- variety tests, Mo. 57, Fla. 799.

Cacao—

- fermentation, 193.
- swollen shoot and dieback, 817.

- Cacti of Arizona and California deserts, 32.
- Cactus, giant, bacterial necrosis, 243, Ariz. 805.

- Caddisfly larvae fouling a water tunnel, 250.

Cake(s)—

- baking characteristics of Illinois wheat flours, Ill. 589.
- baking, suitability of frozen eggs in, 883.
- sweeter, at higher altitudes due to water tolerance of new shortenings, Colo. 304.

- Calcification rate during growth, relation to plane of protein intake, 452.

Calcium—

- and magnesium studies, Tenn. 342.
- and phosphorus retention, effect of nitrogen retention, 595.
- and phosphorus studies in normal adults, 451.

- body, mobilization for shell formation in pullets, 409.

- carbonate, decomposition temperature, 173.

- cyanamide, toxic limits of, Fla. 769.

- excess in poultry diet, effect, 838, Mass. 837.

- in California head lettuce and distribution in outer and inner leaves, 142.

- intake, optimal, life-time experiments, 143.

- lignosulfonate, decomposition by wood-destroying and soil fungi, 85.

- limestone as source, Mo. 22.

- low diets and bone fractures, 595.

- pectate as tissue firming compound in treatment of tomatoes with calcium chloride, 329.

- phosphorus, iron, and nitrogen metabolism and requirements of young women, Nebr. 746.

- requirement, 453.

- retention, relation to growth and bone development in children, 595.

- serum, effects of large doses of activated sterols, 310.

- sources, including calcite flour, for laying hens, Mass. 837.

- Calculi in sheep not caused by vitamin A deficiency, Idaho 697.

Calf(ves)—

- cartene requirements and green hay as source, Pa. 562.

- colostrum and reconstituted skim milk as substitute for whole milk in ration, S.C. 411.

- dairy, feeding and management, La. 412.

- dairy, on low vitamin A diets, pathology of, 114.

- diphtheria, Wyo. 851.

Calf(ves)—Continued.

- fall beef, deficiencies in rations responsible for death losses, Ind. 697.
- fattening, legume hay v. silages for, Mich. 258.
- finishing, sweetpotato meal v. corn for, Miss. 835.
- for slaughter and breeding, creep-feeding, S.C. 403.
- identical twin, maintained under similar environmental conditions, 209.
- infected with *Oesophagostomum radiatum*, intestinal pathology in, 112.
- losses, prevention at Biltmore Farms, 421.
- magnesium studies in, 412.
- nicotinic acid and manganese requirements, [N.Y.]Cornell 90.
- nutritional requirements, [N.Y.](Cornell 104.
- on milk diets, growth, blood picture, and related physiological phenomena, Mo. 103.
- raising, skin milk substitutes for, Wyo. 842.
- removal of gastrointestinal parasites with phenothiazine, 271.
- substitutes for butterfat in rations, 264.
- unthrifty, use of dried whey in ration, S.C. 411.
- utilization of energy in balanced rations, 405.
- wintering, roughages for, Wyo. 831.
- California Station notes, 324, 466, 610, 900.
- California University notes, 324, 466, 610, 900.
- Calocephala leayana*, biology and control, 549.
- Camellia—
 - dieback disease, Fla. 806.
 - diseases, new, in Gulf coast area, 245.
 - stem canker, N.J. 817.
- Canaigre, economic value, Ariz. 791.
- Cananga odorata*, pruning, P.R. 668.
- Candida* causing date spoilage, 523.
- Cankerworm, spring, emergency research, Iowa 247.
- Canneries—
 - capacity and quantity of products canned, S.C. 435.
 - community, in South Carolina, survey, S.C. 441.
 - cooperative, sales and distribution policies, U.S.D.A. 441.
- Cannibalism in poultry, salt and protein feeds as preventive, Wis. 555.
- Canning crops, production, research activities, N.Y.State 801.
- Cantaloup, *see* Muskmelon(s)
- Capillaria annulata*, life cycle, 554.
- Capillary fragility and vitamin P, 156.
- Capitophorus fragaefolii*, *see* Strawberry aphid.
- Carambola, nonvolatile acids of and identification of source of acidity, P.R. 617.

Carbohydrate(s)—

- in plants, origin and transformation, 783.
- metabolism hormone, Mo. 103.

Carbon—

- black, use to activate early tobacco growth, Conn.[New Haven] 797.

dioxide—

- absorption, inexpensive vessel for, 42.

- depressant effect on photosynthesis, 202.

- detection from mixtures of carbonates and sulfites, 177.

- heterotrophic assimilation by bacteria and by animal tissue, 192.

- heterotrophic, assimilation, heavy carbon as tracer, 166.

- in blood and other fluids, determination, 177.

- radioactive, use in photosynthesis, 485.

- utilization, radioactive carbon as indicator, 202.

- in soils under different soil treatment, Mo. 22.

- monoxide in blood, determination, 177.

- organic, of soils, effect of rotation and fertilizer treatments, N.H. 344.

- Carbonate determination, rapid procedure, 177.

Carnation(s)—

- disease resistance and heredity in, Mass. 800, 807.

- electric light for, 278.

- flowers, splitting, effect of K on, Ill. 523.

- greenhouse, thrips as pests, Wash. 394.

- nutritional symptoms in, 225.

- soils, timing, Mass. 800.

- verticilliosis, 243.

- virus yellows, Wash. 378.

- wilt and root rot, cause, 69.

Carotene—

- alfalfa v. lespedeza feeds as source, S.C. 403.

- and vitamin A absorption by chickens, relation to lecithin, N.J. 403.

- determination, developments in methods, 7.

- extraction from plant material, 763.

- in alfalfa meal, determination methods, 7.

- in blood and milk of cows, effect of high vitamin A intake, 844.

- in blood plasma of dairy cattle, relation to vitamin A deficiency, 844.

- in carrot, cytological study, 200.

- in dehydrated alfalfa meal, retarding destruction by ground raw soybeans, Idaho 616.

- in grass mixtures for feed, 257.

- in leaves, determination, 337.

- in rations of dairy cows, relative availability, Ind. 704.

Carotene—Continued.

in wheat harvested at successive stages, 200.

in whole-wheat flour and bread, 145.

in yellow corn, determination, 8.

injected, and vitamin A, comparative physiologic value, 892.

intake relation to blood carotene values of dairy cattle, 410.

Carotenoid pigments—

and content of corn grains, Ind. 616.

and content of vegetables, Ind. 616.

bacterial, isolation, and determination of absorption spectrum maxima, 33.

isomerization of, 485.

Carotenoids—

Carr-Price reaction, significance to chemical measurement of vitamin A, 479.

chemistry of, 4.

human excretion of, 749.

of watermelon, 312.

Carp, raw, feeding to chicks, inactivation of vitamin B₁ by, 702.

Carpet beetle—

biology, [N.Y.]Cornell 95.

black, biology, [N.Y.]Cornell 94.

black, two species, 821.

evaluating protection of fabrics from, 825.

studies, 549.

varied, biology, [N.Y.]Cornell 94.

Carpet grass pastures, establishing and maintaining annual clovers in, S.C. 367.

Carpocapsa pomonella, see Codling moth.

Carrot(s)—

calcium in, utilization by adults, 889.

calcium, phosphorus, and iron in, range of, Ariz. 880.

carotene in, cytological study, 200.

culture of cambial tissue, 196.

culture tests, Fla. 799.

dried, ascorbic acid in, 751.

rots, prevention by low storage temperatures, Idaho 679.

seed treatments recommended for, N.Y. State 222.

variety tests, Fla. 799.

weevil control, N.J. 695.

Caseln—

as source of protein for chicks, 702.

fiber determination, 753.

iodinated, thyroïdal activity, effect of progressive iodination on, 267.

Cassava variety tests, P.R.U. 213.

Cassava wilt, cause, 69.

Castor-bean(s)—

production tests, P.R.U. 213

sheller, new, Tenn. 728.

shelling, 125.

thresher, home-made, 579.

variety tests, Ariz. 791, Ky. 702.

Castration, effect on feather weight in fowls, 790.

Cat(s)—

deaf white, three generations of, 361.

Cat(s)—Continued.

fetal, newborn, and adult, heart and lung weight, 655.

prenatal growth, 50.

Catalase, chemical nature, 471.

Cataract—

in rats on flavin-deficient diets, Mo. 145.

nutritional, cause and control, Mass. 880.

Catorama neltumae, new beetle from Puerto Rico, from mesquite seed pods, P.R.U. 400.

Catsup, vitamin C in, Mass. 760.

Cattle—see also Calf(ves), Cow(s), Heifer(s), Livestock, and Steers.

artificial breeding, four years of, results, 104.

baby beef, economical production, S.Dak. 554.

balance experiments, correction of heat production for changes in live weight, 555.

barley and corn for fattening, Mo. 99.

beef—

Alyceclover and lespedeza as hay crops for wintering, Miss. 609.

copper, cobalt, and aluminum requirements, Fla. 833.

feed crop production and utilization, Fla. 833.

feeding experiments with alfalfa hay, Nev. 835.

grazing tests with Napier grass, Fla. 833.

live-weight gains, effect of grazing method, Mo. 53.

milk secretion, effect of thyroxine, Ind. 655.

pasture studies on Everglades soils, Fla. 833.

production, rotation pastures v. permanent pastures for, Ind. 659.

record of performance tests, discussion of feeding period in, 98.

use of pastures receiving different treatments, S.C. 403.

wintering, 98.

wintering, rations compared, Fla. 833.

beef-cow herds, returns from, Ky. 866.

blood analysis of, Ariz. 760.

blood chemistry during oestral cycle, 212.

chromosome counts, Mo. 47.

cobalt and copper supplied by forage, Fla. 833.

continuous rotation and supplemental grazing on bluegrass pastures, Mo. 98.

dairy—

alfalfa-bromegrass v. bluegrass pastures for, Ind. 704.

birth weight, growth rate, and type, effect of inbreeding, 208, 410.

blood carotene, relation to carotene intake by, 410.

carotene in blood plasma, relation to vitamin A deficiency, 844.

electrocardiograph studies, 846.

Cattle—Continued.

dairy—continued.

- enterprise, profitableness in various regions, P.R.U. 284.
- experimental breeding for Tropics, 788.
- fermentation energy losses in, Mo. 103.
- for economical production, improving, 104.
- heavy grain feeding, economy of, Pa. 562.
- normal growth, Ariz. 841.
- nutrition, minerals in, 705.
- nutritional deficiencies, 104.
- peanut meal for, 410.
- repeatability of type ratings in, 264.
- diseases, *see specific diseases*.
- endoparasites, treatment and prevention, U.S.D.A. 112.
- energy metabolism, Pa. 99.
- falling disease and copper deficiency, 568.
- fattening, Atlas sorgo v. corn silage for, Ind. 697.
- fattening, first and third cuttings of alfalfa hay with cottonseed hulls for, N.Mex. 403.
- feed, lemon grass residue as, P.R. 617.
- feed, production, rotation pastures v. cultivated crops, Mo. 53, 99.
- feeder, shipped into Minnesota, Minn. 732.
- feeding, commercial, cost data, Iowa 283.
- feeding methods of Iowa farmers, Iowa 132.
- feeding test with Coes sorghum grain, Colo. 835.
- giving low titer reactions to Bang's agglutination test, studies, Mo. 108.
- grazing on range land, relation to vegetative composition, Nebr. 506.
- grubs, control, dry cube or derris with wettable sulfur for, 247.
- grubs, control with power sprayers, 247.
- grubs, studies, U.S.D.A. 89.
- Guernseys and Jerseys, history, 264.
- herd management, experimental, Calif. 698.
- herds free from Bang's disease reactors, abortion and sterility in, Ind. 710.
- Hereford, large and small type, studies, Mont. 555.
- Hereford, record of performance, Mont. 360.
- Holstein-Friesian, effect of inbreeding, Iowa 209.
- horned, shipping, benefit of horn-tipping, Miss. 405.
- introduction into Colonial North America, 264.
- Jersey, breeding studies in station herd, Mo. 47.
- Jersey, resting energy metabolism and ventilation rate relation to body weight, Mo. 265.

Cattle—Continued.

- Jersey v. Holstein, efficiency in utilizing vitamin D in rations, S.Dak. 563.
- Kee, studies, Ill. 546, U.S.D.A. 89.
- longevity of vacinia immunity in, 853.
- metabolism stalls for, 704.
- of European breeds, suitability of white highlands of Kenya for, 209.
- of unknown age, estimating live weight from chest girth, Mo. 103.
- *on ranches, financial and physical data, N.Mex. 435.
- parasites, notes, P.R.U. 270.
- physiological and gravitational weight, relation, Mo. 103.
- poisoning—*see also* plant(s), poisonous, and specific plants.
 - from cloak fern, Tex. 505.
- ranches, livestock production and intensity of grazing, N.Mex. 435.
- range, growth and production factors in, Mont. 556.
- range, treatment for warbles, Ariz. 851.
- rations, deficiencies in calcium and phosphorus, Wyo. 831.
- reproductive efficiency, method of determining, 496.
- salting and watering habits, automatic recording, 405.
- scale of heat tolerance for, 98.
- Shorthorn Bluebloods, purchase by college, Utah 323.
- sterility in, hormones for combating, [N.Y.]Cornell 47.
- tested with mammalian and avian tuberculosis, determining sensitizing agent, 114.
- ticks, *see* Tick(s).
- two year-old, finishing, corn of different types compared, Tenn. 699.
- weight gains, effect of weeds and shrubs in grass pasture, Colo. 258.
- Zebu (Brahman) cross, possibilities in North Australia, 48.

Cauliflower—

- boron nutrition, relation to browning, [N.Y.]Cornell 537.
- calcium of, utilization, 143.
- club root control, [N.Y.]Cornell 67.
- dried, ascorbic acid in, 751.
- growth, effect of vitamins, 39.

Cedar(s)—

- eastern red, producing seedlings of, Okla. 677.
- Ozark white, for upper Mississippi region, 525.
- red, control of cedar-apple rust on, 79.
- rust, *see* Apple rust.
- white, bluestaining fungus in heartwood, 693.
- white, *Phomopsis juniperovora* blight of, 229.

Celery—

- blights, control, Fla. 806.
- breeding, [N.Y.]Cornell 57.

Celery—Continued.

- carrot weevil as serious pest, biology and control, N.J. 696.
- diseases, seed and seedbed treatments, Fla. 806.
- grown on peat soil, use of copper and boron for, Wis. 513.
- late blight in Argentina, 538.
- mosaic caused by alfalfa mosaic virus, 538.
- soil, fertilizer, and variety studies, Fla. 799.
- spraying experiments, 538.
- stalk worm, life history and habits, 401.
- vapo-dusting, Fla. 806.
- Cell-nuclear size, regularity of, relation to growth and maturity of plants, 650.
- Cell vacuoles of Zn-deficient plants, spherical inclusions in, 809.
- Cellular metabolism, role of CO₂ in, 202.
- Cellulose—

- action of light on, 176.
- action of mesophilic bacteria on, 636.
- in layers of tracheids, orientation, significance of X rays in study, 493.
- new microchemical reaction for, 336.
- structure, revealed by optical and X-ray methods, 204.

Centaurea cyanus, *Sclerotinia* stem rot on, Mo. 67.

Cephalosporium—

acremonium, mode of entrance into corn ears, 383.

dieffenbachiae n.sp., description, 82.

Cerambycidae of North America, origin and distribution, 89.

Ceratitis capitata, see Fruitfly, Mediterranean.

Ceratostomella—

spp., wood-staining, temperature, moisture, and penetration studies, U.S.D.A. 84.

ulmi, reactivation in occluded infections and contamination of *Scolytus multistriatus*, 833.

ulmi, toxin formation by, 693.

vitamin deficiencies of, 350.

Ceroospora—

capsici lesions on pepper, new species of fungus attacking, 238.

leaf spot of peanuts, control, 67.

n.spp. in United States, U.S.D.A. 680.

new leaf-parasitizing species, 807.

sesami, notes, S.C. 378.

sebrina from red clover seed, 683.

Ceroosporella—

leaf spot of privet, 229.

poagens n.sp., notes, 682.

Cereal(s)—see also Grain(s) and specific grains.

diseases, U.S.D.A. 805.

diseases in Kansas, U.S.D.A. 527, 680.

grain production by combine harvester and hammer mill, encouragement, Me. 280.

Cereal(s)—Continued.

grass, dried, effect on egg production and hatchability, 840.

grass juice for rabbits, Mo. 98.

in Canada, seed-borne fungi on, 532.

iron in, 475.

milling products, distribution of vitamin E in, 154.

parasitic fungi on, U.S.D.A. 680.

powdery mildews, 229.

products, nicotinic acid in, determination, 13.

riboflavin, analysis of, 621.

rusts, effect of light and temperature on viability of urediospores, 810.

rusts, reports, U.S.D.A. 680.

starch and crude fiber, digestion by minks and foxes, 407.

stored, insects, control, U.S.D.A. 88.

thiamin in, thiochrome method of analysis, 9.

Cerebella genus, biologic status and use, 807.

Cercia bubalus, see Buffalo treehopper.

Chabertia ovina in sheep on irrigated pastures, Oreg. 856.

Chalaropsis thielavioides on Chinese elm, 389.

Chalcidoidea, new species, descriptions, 402.

Chalcodermus aeneus, see Cowpea curculio.

Chamaecyparis root rot, 381.

Changa—

Larra parasites of, 97.

on cigar-type tobacco in South, U.S.D.A. 394.

parasite, establishment, P.R.U. 248.

Chaoborus astiotopus, see Gnat, Clear Lake.

Charcoal—

kiln, portable, studies, Conn.[New Haven] 860.

rot on potatoes in Illinois, U.S.D.A. 377.

Cheese—

American, manufactured from pasteurized milk, 107.

and butter cultures, mechanism of dissimulation of carbon sources in, Iowa 263.

blue mold, curing, use of mountain funnel for, S.C. 411.

brick, bacteria in during ripening, 413.

brick, bacteriology, 708.

canning for storage, Wash. 411.

Cheddar—

American, practical moisture test for, Mich. 762.

and blue, ripening, role of lipolytic enzymes in, Iowa 263.

inhibiting mold growth in, Pa. 563.

rancidity development in, 108, Idaho 703.

reversibility of oxidative inactivation of milk lipase in, 269.

ripened, white particles found on, 270.

Cornhusker, manufacture, Nebr. 850.

cottage, preservation, N.Dak. 708.

defects and diseases, 413.

Cheese—Continued.

- foreign-type, effect of pasteurization of milk for, 161.
- foreign varieties, manufacture, ripening, and development, Wash. 411.
- Limburger, manufacturing processes, N.Y.State 270.
- makers, improved practices for, 850.
- measuring physical properties, devices for, 416.
- skipper, pyrethrum-sesame oil aerosol used against, 821.
- starters in New Zealand, progress and present position of research, 850.
- Swiss, gassy, micro-organisms associated with, 413.
- varieties suitable to Washington conditions, development, Wash. 411.

Chelonus annulipes, breeding on Mediterranean flour moth, methods, U.S.D.A. 254.

Chemical—

- analysis, instrumental methods, 474.
- research, agricultural, Liebig's influence in promotion, 616.

Chemistry, agricultural, century of progress in, 616.

Cherry(les)—

- and their hybrids, chromosomes and fertility, 45.
- bacterial gummosis, Idaho 679.
- banded chlorosis, 816.
- brown rot control, new fungicide for, 531.
- buckskin disease in Oregon, U.S.D.A. 377.
- cost of production, [N.Y.]Cornell 129.
- cuttings, use of growth substances for, Pa. 513.
- diseases in Ozark section of Arkansas, U.S.D.A. 66.
- effect of low winter temperatures, Ill. 516.
- flowering, virus disease of, 388.
- fruitworm, life history and control, Wash. 394.
- leaf spot control, 240, Ill. 528, Wis. 528.
- little disease and virus nature, 528.
- mahaleb, value as understock, Ill. 516.
- maraschino, dyeing with erythrosine, 18.
- Montmorency, concentration of growth hormone and fruitfulness in, 673.
- nursery stock, annual bacterial canker of, Mo. 67.
- orchards, soil management, Pa. 513.
- pollen-tube growth studies in, 45.
- powdery mildew, U.S.D.A. 805.
- rasp-leaf, notes, 240, Colo. 691.
- rootstocks for, Pa. 513.
- sand, susceptibility to brown rot, leaf spot, and plum pocket, S.Dak. 528.
- sour, production, factors affecting, Colo. 519.
- sour, yellows, a virus disease, Wis. 528.
- viruses, U.S.D.A. 805.
- yellows, trade role in control, 816.

Chestnut blight-resistant timber type, breeding for, 83.

Cheyletus mites on tobacco moth, 823.

Chick(s)—

- absorption and disposition of glucose in, 838.
- Barred Plymouth Rock, sexing method, Mass. 789.
- Barred Rock, growth of, Tenn. 701.
- battery brooder, minerals in rations of, 561.
- battery management in Hawaii, Hawaii 701.
- biotin and scaly dermatosis of, 703.
- brooder, diseases of, 719.
- brooding, electric, Mass. 837.
- brooding, electric, in winter, engineering aspects, 434.
- brooding, use of electricity in, Ind. 725.
- carbohydrate levels, effect of hormones, 790.
- cervical vertebrae in, embryology, 655.
- curled-toe paralysis and growth in, relation to riboflavin, 262.
- day-old, gizzard lesions in, 275, 561.
- day-old, sexing methods, N.J. 360, 658.
- diet, protein sources in, 408.
- effect of ultraviolet irradiation, Ind. 698.
- electric brooding under winter conditions, Pa. 102.
- embryo, synthesis of amino acids by, 698.
- gizzard erosion in, growth rate as factor, 262.
- glycine requirement, 838.
- green feeds for, comparison, Tenn. 404.
- growing, feeding, and management, Iowa 837.
- growth, effect of electric lights, Ind. 698.
- growth on skim milk powder but no green feed, N.J. 403.
- growth rate relation to size of thymus and bursa *Fabricius*, 263.
- growth variability, effects of nutrition, 559.
- induction of mating behavior following injection of sex hormones, 365.
- infected with tapeworm, growth rate effect of protein diet, 263.
- magnesium requirement, 839.
- manganese availability, effect of mineral supplements, 274.
- nonpathogenicity of western equine encephalomyelitis virus for, 274.
- nutrition, biotin in, 409.
- nutrition, choline and yeast in, 560.
- pantothenic acid requirement, 409.
- protein sources for, comparison, Miss. 702.
- raising in Oklahoma, Okla. 102.
- range or succulent feeds for, Ohio 559.
- ration with soybean meal, fish meal, and dried whey, development, Wash. 404.
- rations, effect of increased and reduced protein in, Ind. 698.
- respiratory disease of, 275.

Chick(s)—Continued.

- riboflavin-deficient, metabolism and food utilization, 839.
- simplified rations for, Mo. 98.
- slipped tendon in, *see* Perosis.
- soybean meal and corn substitution for bran and middlings, Ind. 698.
- treatment with radiant energy and effect on fowl leucosis, Iowa 270.
- twin, viable, 211.
- utilization of carotene by, S.C. 403.
- vitality, effect of breeding, N.J. 701.
- vitamin A and carotene in livers and blood, effect of ethyl alcohol and cresol, 261.
- vitamin B₆ requirement, 839.
- vitamin K deficient, effect of administration of hesperidin, ascorbic acid, and massive doses of vitamin D to, 560.

White Leghorn, variations in down color, insignificance, 49.

Chicken(s)—*see also* Chick(s), Fowl(s), Hens, Poultry, *etc.*

- broiler, corn substitutes in rations, Ind. 698.
- broilers and fryers of Del-Mar-Va and Virginia, grade and price comparisons, 586.
- dressed broilers held at 1.7° C., palatability and histological changes, 881.
- feathers, lanthionine isolation from, 166.
- lice, effect of sulfur on body populations, Fla. 851.
- nicotinic acid in, 150.
- roaster sized, "freezer burn" prevention, Mich. 764.

Chickpea—

- foot rot cause, 232.
- resistance to blight disease, determination, 232.

Child(ren)—*see also* Girls and Infants.

- ascorbic acid in plasma before and after dietetic adjustment, 152.
- diabetic, under good control, effect of adding vitamin B complex to diet, 601.
- energy metabolism, effect of tea, 888.
- from different economic levels in Chicago, physical fitness, 888.
- growth and bone development, relation to calcium, phosphorus, and nitrogen retention, 595.
- health and Selective Service physical standards, 311.
- high school, dark adaptation at different income levels, 743.
- in selected communities, food habits and nutritional status, Me. 302.
- Negro school, prevalence of dirt or clay eating, 889.
- preschool, magnesium needs, 596.
- school, hemoglobin and vitamin in blood of, S.C. 455.
- school, vitamin C nutrition in, 316, Me. 316.

Chilo plejadellus, *see* Rice stalk borer.

Chlorocorus cacti, notes, P.R. 695.

Chinch bug—

- abundance at Lawton, Okla., effect of weather conditions, 548.
- biometrics and control, Iowa 248.
- control, U.S.D.A. 88.
- injury, varietal resistance of sorghum to, Okla. 617.
- preferred breeding ground for, Ill. 546.
- Chinchillas, *Salmonella typhimurium* infections in, bacterin treatment, 118.
- Chionaspis furfura*, *see* Scurfy scale.

Chlorella—

- photosynthesis in, inhibitory effects of inorganic compounds, 493.
- vulgaris*, growth-inhibitor formed by, properties, 32.
- vulgaris*, rate of photosynthesis, relation to carbon dioxide concentration, 31.

Chlorides, accumulation by plant cells and relation to respiration, 201.

Chlorine, review of literature, 192.

Chlorochroa sayi, *see* Stinkbug, Say.

Chlorophyll(s)—

- a and b, analysis of plant extracts for, 333, 619.
- chemistry of, 4.
- components, number of, 41.
- in green leaves and iron, 356.
- in wheat harvested at successive stages, 200.
- solutions, absorption of light by, 41.
- spectroscopy of, Ind. 616.

Chlorophyll-protein complex, electrophoresis, 203.

Chloropidae of World, genotypes, list, 256.

Chloroplast(s)—

- granules, composition, relation to structure, 493.
- isolated, oxygen production by, 32.

Chlorosis—

- control in cottonwood trees and other plants, Wyo. 692.
- in Concord grape, effect of root on, 542.
- in ornamental figs, Fla. 799.
- in pin oaks, control, N.J. 378.

Chocolate milk, bacteriology, Mass. 760.

Chocolate sirups, bacteriology, Mass. 760.

Chokecherry, X-disease, [N.Y.] Cornell 68.

Cholesterol determination, new method and application, 336.

Choline deficiency, biological and chemical studies related to, 698.

Choline in poultry rations, Wash. 404.

Chondrodystrophy, hereditary, in fowl, [N.Y.] Cornell 47.

Chorizagrotis auxiliaris, *see* Cutworm, army.

Christmas tree plantation and livestock pasture, combining on cut-over lands, Mich. 804.

Chromatographic adsorption analysis, 627.

Chromosome(s)—

- and genes, structure and organization, 495.
- breakage and sterility in mice, 363.

Chromosome(s)—Continued.

counts in plants with small chromosomes, 358.

in plants, number, form, and behavior, [N.Y.]Cornell 53.

numbers in Hydrophyllaceae, 495.

somatic and homotypic, structure in, 31.

Chrysanthemum(s)—

blindness in, causes [N.Y.]Cornell 64.

breeding, Tenn. 371.

cuttings, root structure, effect of root media, Mass. 775.

diseases, 243.

fall blooming, effect of short days, 225.
greenhouse, colchicine-induced polyploids, 46.

morifolium, seedling, anatomical study, 30.

Verticillium disease in greenhouse, [N.Y.]Cornell 68.

Verticillium wilt control, Ohio 817.

Chufa, weevils affecting, 95.

Church, rural, relation to other rural organizations, 878.

Chytrids, parasitism among, 230.

Cicadellidae at Chatham, Va., check list and new records for State, 549.

Cicadula bimaculata, transmission of wallaby ear disease of corn by, 812.

Clder production, effect of corky apples, 20.

Cigarette beetle—

control, U.S.D.A. 88.

in tobacco warehouses, natural enemies of, 822.

Cinchona—

seedlings, sensitivity to light intensity, P.R. 668.

seeds, loss of viability in, P.R. 668.

Cineraria virus diseases, Wash. 378.

Cirphis unipuncta, see Armyworm.

Citric acid excretion, relation to thiamin deficiency, 315.

Citrin solutions, crude, from lemons, preparation and estimation, 482.

Citronella and lemon grass *Helminthosporium* spot, 533.

d,l-Citruiline, synthesis, from nonbiological precursors, 4.

Citrus—

breeding, Fla. 790.

brown rot, control in orchard and packing house, 81.

brown rot gummosis prevention, 817.

bud mite control, 403.

canker eradication, U.S.D.A. 66.

chlorosis, lime induced, relation to soil factors, 64.

cost of production and grove organization, Fla. 869.

culture, Fla. 799.

diseases, color handbook of, 542.

dry root rot associated with *Fusarium* spp., Ariz. 805.

fertilization, Ariz. 798.

fertilizer requirements, Fla. 799.

Citrus—Continued.

fruit(s)—see also *specifio kinds*.

diseases in storage, prevention, 529.

filtered, auto-oxidation, 140.

freezing preservation, 17.

melanose and stem-end rots, Fla. 800.

quality studies, effect of nutritional treatments, Fla. 799.

yields, "normal", development for yield insurance plan, 583.

gummosis and brown rot fungus, life activities and control, 81.

insects, studies, 391.

juices and pulps, preservation, Fla. 760.

juices, freezing preservation, 17.

leprosis control in Brazil, 542.

maturity studies, Fla. 760.

melanose control, 542.

mycoflora in Georgian S. S. R., 529.

nitrogenous fertilizers for, Fla. 799.

orchard soils, cultural and fertilizer practices, 224.

peroxidase, distribution and preparation, 490.

production and physiological studies, Fla. 799.

progeny and bud selection, Fla. 799.

psorosis, successful transmission by bark grafting, 387.

rust mite in Florida, U.S.D.A. 88.

rust mites, 554.

scab control, Fla. 806.

species, *Phomopsis* sp. on, 542.

stem-end rot, comparative behavior of *Diplodia* and *Phomopsis* as cause, 542.

thrips control, improvements in insecticides for, U.S.D.A. 88.

thrips, reactions to sugar in poisoned baits, 250.

tissues, hydrocyanic acid absorbed by, during fumigation, Calif. 674.

trees, moisture studies under, using tensiometers, 674.

trees, top regeneration, effect of severity of pruning, 521.

varieties, new and new combinations, 35.

variety tests, Fla. 799.

Cladis nitidula, scale predator, notes, P.R. 695.

Cladosporium humile, perfect stage of, cause of maple leaf spot, 389.

Clay(s)—

material, degree of sorption, effect of stage of decomposition of organic matter, Idaho 632.

minerals, identification in Iowa soils by thermal method, 632.

minerals, thermal method as quantitative measure of, 633.

nature of, determination, Wis. 483.

particles, studies, with electron microscope, 24.

Clematis varieties, hardiness, Mass. 800.

Click beetles, life histories and habits, 253.

Climate(s)—see also Meteorology.

and accelerated soil erosion in arid and semiarid Southwest, U.S.D.A. 764.
climax, and conservation, 485.
of California, Köppen classification, 766.
relation to plant diseases, 527.

Climatic—

changes from timberline of Mount Washington, indications of, 631.
history, post-Pleistocene, of Prince William Sound region, Alaska, 36.
variability, index of, 631.

Climatological—

data, 22, 631, Ohio 482.
data on forest plantation in Nebraska sandhills, 182.
records of United States, development, 631.

Climatology of U. S., regional, hail as factor in, 766.***Clitocybe* root rot of bananas and other plants, 542.*****Clostridium*—**

acidi-uridi n.sp. from soil, 349.
botulinum, type B, differential characters of strains, action of toxins, 720.
cylindrosporum n.sp. from soil, 349.
kluyveri concerned in formation of caproic acid from ethyl alcohol, 349.
spp., growth in anaerobic media, 34.
thermoaceticum n.sp., fermentation of glucose by, new type, 776.

Clothes moth—

control, sodium fluosilicate v. sodium fluoride for, Ill. 546.
evaluating protection of fabrics from, 825.

Clothes, work, for women, U.S.D.A. 897.**Clothing—**

family expenditures for, U.S.D.A. 158.
supplies for college students, Miss. 897.

Clover(s)—

adaptation of foreign and domestic varieties, [N.Y.]Cornell 53.
crimson, fertility and pH levels for, S.C. 387.
fertilizer tests, Fla. 791.
inoculation methods, Fla. 792.
insects, N.Dak. 248.

Ladino—

and timothy mixture, methods for ensiling, Me. 264.
effect on milk yield, 2.
for Northeastern States, U.S.D.A. 795.
place in New Jersey farming, N.J. 366.

Lappacea, production tests, Tenn. 367.
leafhoppers, toxicities of bordeaux mixture, pyrethrum, and derris to, 828.

red—

and alfalfa mixtures, Ky. 792.
and subterranean, seed, pathogenic fungi in, 682.
better strains, N.J. 369.

Clover(s)—Continued.**red—continued.**

breeding, Ind. 659, Iowa 212, Ky. 702, Tenn. 367.
culture tests, N.J. 504.
cutting tests, Ill. 504.
developmental anatomy, 191.
medium and mammoth, effect of cutting at different stages, Iowa 212.
nurse crop experiment with, Iowa 212.
roots, depth and spread, relation to soil treatment, N.J. 366.
rotation studies, Va. 793.
seed setting, hybridization, and length of corolla tubes, Iowa 212.
strains, place in New Jersey farming, N.J. 366.
variety tests, Ill. 504, Iowa 212, Ky. 792, N.J. 366, Pa. 504.
vernalization treatment and photo-periodic induction, 369.
root borer, biology and control, [N.Y.] Cornell 90.
seed germination, Iowa 213.
seed production experiments, 512, Idaho 659.
variety tests, Ariz. 791, Del. 212, Fla. 791, Ill. 504.

white—

fluctuation and distribution, 661.
germination and growth, effect of thiamin additions, N.J. 368.
mosaic, complex nature of, 73.
pastures, management and returns on, Mich. 264.
pseudo-self-compatibility and relation to cross-incompatibility in, 652.
red, and crimson, selection and improvement, Del. 212.
seed production, effect of clipping, Del. 212.
vernalization treatment and photo-periodic induction, 369.

Clover-seed caterpillar, notes, Del. 245.

Clubroot resistance, role of mustard oil in, Wis. 528.

***Clypeothecium*, taxonomic data, 487.**

Coacervates in physical and biological systems, 809.

Cobalt—

deficiency in sheep, development, 716.
radioactive, metabolism studies, 747.
requirements of beef cattle, Fla. 833.

Coccidia infesting Rocky Mountain bighorn sheep in Wyoming, Wyo. 278.

Coccidioides immitis causing club formation in granulomatous suppurating processes in cattle, 718.

Coccidiosis—

among sage grouse and other wildlife, 719.
bovine, diagnosis, overlooked intestinal lesion of value in, 272.

Coccidiosis—Continued.

- control in chickens, Oreg. 859.
- effect of feeding concentrated physiological saline to chickens, 119.
- in calves, 272.
- in chickens, ineffectiveness of cow urine in control, 720.
- in chickens, sulfur compounds for prevention, 119.
- in silage-fed feeder lambs, experimental production, 422.
- prevention, flowers of sulfur and charcoal for, 275.

Coccinellid(s)—

- predator of white peach scale on papaya, P.R. 695.
- predatory on bamboo scales, collection in Trinidad and Brazil, 89.

Coccytrypes n.spp. and biology, 546.

Cochlonema—

- bactrosporium longius* n.var., description, 530.
- euryblastum* n.sp., destructive to soil amoebae, 530.

Cock(s)—

- Brown Leghorn, hen-feathering in, 49.
- fertility cycles in, Mass. 789.

Cockerel(s)—

- and pullets, comparative growth response to protein supplements, Wash. 404.
- sperm production and testes size in, Tenn. 360.
- weights of reproductive organs and viscera, action of prolactin and oestrone on, 502.

Cockroach—

American—

- distribution of arsenic in body, 249.
- resistance to sodium arsenite and nicotine, factors affecting, 397.
- toxicity of hellebore to, 249.

control, Ind. 694.

German, effectiveness of dust mixtures against, 827.

Cockroach plant—

- economic value, Ariz. 791.
- nomenclature, Ariz. 776.

Cocoa—

- and iron-fortified cocoa mixtures, availability of iron in, 709.
- and iron-fortified cocoa mixtures, nutritive value of iron in, Mass. 880.
- effect on coagulation of milk, Mass. 842.
- powders, bacteriology, Mass. 760.

Coconut—

- caterpillar, bethylid parasite of, 403.
- cream, rancidity, prevention, P.R.U. 165.
- seeds, viability after floating in sea, 353.

Codling moth—

- bionomics and control, Iowa 247.
- clean-up experiment, 395.

control—

- U.S.D.A. 87.
- and birds in Ozarks, 254.
- factors affecting, 254.

Codling moth—Continued.

control—continued.

- light mineral oils for, ovicidal value, 395.

programs, N.Y.State 402.

- replacing lead arsenate in, Wash. 394.

- rotenone and other organic insecticides for, 829.

- scraping and banding results, 395.
- with insecticides, 395.

- with light trap, Wash. 428.

cover sprays, 547.

cover sprays, timing, 400.

ease of control in different years, 395.

flight and worm entries, 824.

larvae attractants, 821.

larvae, *Tenebroides corticallis* on, 247.

larvae, toxicity of phenothiazine to, effect of bentonite and of hydrated lime, 821.

larvae, toxicity of semicarbazones to, 253.

menace, 551.

on pears, control, 824.

second-brood, spraying for control, 393.

studies, Ind. 694, Mo. 85, N.Mex. 393.

tolerance to toxic action of insecticides, Mo. 85.

Cod-liver oil—

- polyethenoid esters from, effect of vacuum distillation on absorption spectra, 167.

- rations v. irradiation from sun lamps, effect on egg production and hatchability, Mich. 262.

- stored in mixed feeds, effect of manganese sulfate on stability of vitamins in, 555.

Coclophora—

- inaequalis*, shipment to Louisiana, P.R. 695.

malivorella, see Pistol casebearer.*Coenurus* species, differentiation by hook measurement, 392.

Coffee—

- chaff as soil amendment, Mass. 800.

- Columnaris variety, productivity and growth, P.R. 668.

- disease in Angola, 81.

- farming, profitability, P.R.U. 284.

- Fusarium* root rot, P.R.U. 229.

- groves, hormiguilla in, poison for control, P.R.U. 248.

- leaf-miner, notes, P.R.U. 248.

- pruning, comparative studies, P.R.U. 465.
- research, P.R.U. 221.

Coleoptera

- associated with ironweed, 540.

- introduction and lists, 90.

- new, from Puerto Rico, P.R.U. 400.

- of Washington: Scolytoidea, 400.

Coleosporium hellanthei, nuclear phenomena involved at meiosis in, 807.

Coleus plants, yellow, transpiration rate, effects of inert dusts, 197.

Coliform—

bacteria, relation to bacterial plant pathogens, 228.

organisms and pasteurization, 107.

Collagen in animal tissues, determination, rapid method for, Iowa 256.

College—

men, basal metabolism of, Wyo. 880.

students, clothing supplies for, Miss. 897.

students, dietary habits, 592.

Colletotrichum—

falcatum, notes, 535.

falcatum, physiological studies, 70.

genus, studies, 70.

gloeosporioides growth in culture, *Actinomyces* inhibiting, 486.

lagenarium on honeydew melon, Colo. 238.

indemuthianum on beans, varietal susceptibility, 529.

sp. on corn, 234.

trichellum on stems of ivy, U.S.D.A. 805.

Colloidal complex and plant nutrition, adsorbed ions on, 772.

Colloids, soil, effect on plant growth, 25.

Collops bipunctatus, notes, 247.

Colon-typhoid-dysentery group, effect of sulfonamide derivatives, 564.

Color system—

permanganate-periodate, stability, 171.

two-component, colorimetric analysis, 171.

Colorado Station notes, 756.

Colostrum and milk, examination for *Brucella abortus*, 567.

Colts, growth and development, Iowa 257.

Combine(s)—

efficiency at various stubble heights, 862.

power take-off driven, horsepower requirements, 123.

small, studies, Mo. 120.

smaller, use, effect of field and crop conditions, Ill. 573.

Commodity Credit Corporation, laws and executive orders concerning, U.S.D.A. 437.

Community—

life in Iowa during World War I, Iowa 135.

local, and social control, 738.

organization, Ky. 877.

Riner, population turnover in, Va. 737.

Concrete—

coatings, acid-resistant, 121.

expansion through reaction between cement and aggregate, 121.

masonry wall construction, good practice in, 577.

mixes, design, proposed recommended practice, 121.

plastic flow in under load, effect of change in moisture content, 577.

reduction in amount of cement required in, Idaho 725.

reinforced, saving steel in, proposed emergency code, 577.

Condensers, reflux, support for, 761.

Conifer(s)—

bluestaining fungus inhabiting heartwood, 693.

diseases, new, in Gulf coast area, 245.

rabbits as hazard to plantations of, Mich. 245.

redwood in, seedlings for experimental study, 525.

seedling, damping-off, cause, 83.

squirrel damage to, 545.

Contothyrium psammae, notes, 72.

Connecticut [New Haven] Station—notes, 160, 466, 900.

report, 899.

Conotrachelus nenuphar, see Plum curculio.

Conservation—

and private enterprise, 582.

and society, 582.

objective or ideal, 583.

of natural resources in the Americas, 755.

public policy and action for, 582.

Constructional materials, nonmetallic, 726.

Cooking, utensils, metal, review, 464.

Cooperation, see Agricultural cooperation and Marketing, cooperative.

Cooperative(s)—

agricultural, case studies, Tenn. 294.

associations—

farmers', distribution of machinery by, U.S.D.A. 296.

farmers', milk distribution by, U.S.D.A. 295.

for wool marketing in Kentucky, Ky. 875.

in Michigan for marketing or processing fruits and vegetables, Mich. 874.

marketing eggs, Mich. 875.

canning of fruits and vegetables, U.S.D.A. 295.

effect of milk control programs, 582.

farmers', financial management analysis, Mich. 734.

farmers', personnel management in, U.S.D.A. 294.

horticultural, success in Puerto Rico, P.R.U. 440.

movement, Finnish-initiated consumers', in North Central States, 588.

since World War I, appraisal of changes, Okla. 130.

Cooperia oncophora in horses, 718.

Copper—

adsorption and fixation in sandy soils of central Florida, 190.

and iron, effect on hemoglobin regeneration, 455.

arsenite, new anopheline larvicide, 696.

blood, of ewes during pregnancy, 361.

compounds, reduction in fungicidal value by organic materials, 380.

deficiency of cattle, 568.

fungicides and insecticides, tests of compatibility of inert dust carriers for, Del. 227.

Copper—Continued.

- fungicides and substitutes, safety, N.J. 377.
- fungicides, "insoluble," fungicidal value and tenacity, relation to particle size, 380.
- fungicides, "insoluble," tests, Tenn. 378.
- fungicides, mechanism of action, 380.
- in blood of sheep and of cows, 115.
- in fungicidal sprays, substitutes for, 231.
- reduced by sugars, determination, 332.
- requirements of beef cattle, Fla. 833.
- salt, new in agriculture, use, 381.
- sprays on powdery mildews, stimulatory and toxic effects, 531.
- sprays, studies, Me. 228.
- sulfate drench, composition, effect of storage, 565.
- toxicity, effects of aluminum, 643.
- xanthates, fungicidal and phytocidal properties, 531.

Coralberry seeds, germination studies, 618.

Corn—

- and hog prices and expectations, Iowa 283.
- and oats, comparison as to production, labor, and use, Miss. 795.
- and sorghum in alternate rows, S.Dak. 504.
- and teosinte, cytogenetic study, Mo. 359.
- autotetraploid, fertility and vigor in effect of heterozygosis, 206.
- bacterial wilt—
 - of dent inbreds, 73.
 - resistance, genetic studies, Iowa 228.
- borer, European—
 - colonization of imported parasites of, 89.
 - control, Ind. 694.
 - damage, reduction by late planting Ohio 551.
 - insecticides for control, Mass. 820.
 - moth, egg laying by, height of corn as factor, 550.
 - parasite, reared on Mediterranean flour moth for colonulization, U.S.D.A. 254.
 - resistance of New Jersey corn hybrids and open-pollinated varieties to, N.J. 366.
 - strains of corn resistant to survival, U.S.D.A. 550.
 - studies, 393, Conn.[NewHaven] 822, Del. 245, U.S.D.A. 88.
 - susceptibility of corn strains to, relation to aphid infestation, 252.
- breeding, Conn.[New Haven] 791, Fla. 791, Idaho 659, Ind. 659, Ky. 792, Mo. 52, N.J. 366, [N.Y.]Cornell 53, P.R.U. 213, Pa. 504, S.Dak. 504, Tenn. 367.
- carotene in, factors affecting, Ill. 588.
- caryopsals of, origin of suberized semi-permeable membrane in, 205.

Corn—Continued.

- characteristics relating to industrial utilization, Iowa 165.
- chromosomes in, number, form, and behavior. [N.Y.]Cornell 53.
- cockle, feeding to poultry, effect, 276.
- composition and nutritive value, relation to soil type and fertilizer treatment, Ind. 659.
- cost of husking and cribbling with different corn pickers, Ill. 583.
- crop of 1941, ear rots in, U.S.D.A. 805.
- culture, methods and equipment, Iowa 277.
- culture tests, Fla. 792, S.Dak. 504, Tenn. 307, Wyo. 793.
- curing and storage, Iowa 277.
- cyanamide as source of N for, Ind. 659.
- dent, hybrid and open-pollinated varieties, composition, Ind. 659.
- dent, *Pythium* root rot, relative susceptibility of inbreds to, 683.
- development, interaction of water, growth, hormones, and food supplies in, Iowa 191.
- Diplodia zeae* dry rot, Iowa 228.
- disease(s)—
 - in Philippines, 234.
 - resistance in, measuring, Iowa 228.
 - survey, S.C. 378.
- drilled, production costs, 432.
- ear pests control, P.R. 695.
- ear rot fungi, prevalence and geographic distribution, U.S.D.A. 377.
- ears, mode of entrance of fungi into and symptoms, 383.
- earworm—
 - biology and control, U.S.D.A. 88.
 - control, Ky. 822.
 - control, mineral oil treatment, 829.
 - in sumac sorgho heads, effect of parasites and predators, 821.
 - studies, 393, Ind. 694, Mo. 85, P.R. 695, P.R.U. 394.
 - value of dusting, Ill. 545.
- farm storage, Iowa 277.
- fertilization in southern Illinois, 52.
- fertilization problems in use of ammonium sulfate, Ind. 659.
- fertilizer placement with, Ind. 659.
- fertilizer tests, Ind. 659, Miss. 660, Mo. 53, P.R.U. 213.
- field shelling of, 579.
- for fattening cattle, Mo. 99.
- for oil and protein content, breeding, Ill. 504.
- genetic studies, Conn.[New Haven] 791, Mo. 52.
- grains, carotenoid pigments and content, Ind. 616.
- ground, v. sorghum grain, ground, in dairy rations, S.Dak. 563.
- growing for high yields and low costs, N.J. 369.
- grown on high-lime soils, cation balance, relation to potassium deficiency, 668.

Corn—Continued.

- growth and yield, factors affecting, Iowa 182.
- growth, effect of soil temperature, Mass. 775.
- growth effect of translocations, 206.
- harvested in different ways, effect on gains of steers, Tenn. 404.
- high- and low-protein strains, development, S.Dak. 504.
- hybrid(s)—
 - and open-pollinated varieties, composition, Ind. 659.
 - and varieties, yield tests, Del. 212.
 - chemical studies, Ind. 616.
 - comparisons and production, Mass. 793.
 - development, compared with single crosses and inbreds, Iowa 191.
 - early, yield and other data, N.Dak. 215.
 - field, *Diplodia* stalk rot susceptibility and yielding ability, correlation, Ind. 659.
 - for New Jersey, N.J. 508.
 - help meet production goals in food-for-freedom drive, Colo. 662.
 - performances, Mich. 215.
 - under irrigation in Wyoming, Wyo. 508.
 - use for silage, Ill. 502.
 - v. open-pollinated for growing and fattening hogs, Ind. 697.
 - with injured seed coats, effect of treatment, Ill. 504.
- improvement by inbreeding and by reconstitution, Ill. 504.
- inbred lines resistant to stalk and ear rots, developing, Iowa 228.
- inbreds and hybrids, seed longevity in, inheritance, 206.
- inbreds, relative resistance to rootworms, Ill. 545.
- insects bred from, 394.
- insects, studies, 394.
- internal grain infection by *Gibberella fujikuroi*, 74.
- kernel, composition, changes in during development, 138.
- lanternfly in New Jersey, 93.
- leafhopper studies, P.R.U. 394.
- leaves, green coloring matter in, relation to plant growth, N.J. 366.
- lines, selfed, selection among, Mo. 52.
- manuring systems, effect, Ind. 659.
- Nitidulidae in, 247.
- of different types for finishing 2-year-old cattle, comparison, Tenn. 699.
- ontogeny of stem, action of gene dwarf in, 206.
- open-pollinated v. hybrid for growing and fattening hogs, Ind. 697.
- performance tests, Ill. 53.
- performance tests, cooperative, Ohio 369.
- pickers, efficiency, Iowa 277.

Corn—Continued.

- planting, optimum depth, relation to soil moisture, 52.
- planting tests, Ind. 659.
- pollen, germination, Iowa 191.
- pollen with aberrant nuclei germination capacity, 206.
- protein, fractionation and characterization, Iowa 165.
- proteins, solubility, 327.
- races, recognition and classification, 494.
- research institute projects, Iowa 214.
- returns from nitrogen for on Delta soils, Miss. 52.
- role of summer legumes for, Miss. 52.
- root rot in Ontario, cause, 533.
- root structure, effect of root media, Mass. 775.
- rootworm, northern, damage as cause of lodging, Wis. 546.
- rootworm, relative resistance of inbred strains to, Ill. 545.
- rotation studies, Fla. 792, Va. 793.
- row spacing experiments, 123.
- seed, artificially dried, shrinkage, 282.
- seed-borne pathogens, detecting, laboratory techniques, Iowa 228.
- seed, drying, Ind. 725.
- seed treatment for seedling blights, Mo. 67.
- seed treatment, physiological responses of growing plant and pathogen to, Iowa 191.
- seed treatment, value for insect control, Ill. 545.
- seed, vitality, effect of mass handling, Ill. 504.
- seed, weak, cause of crop failures, N.Y.State 798.
- seed, X-ray sensitivity, effect of temperature and time, 39.
- seedbed and irrigation studies, N.Mex. 366.
- seedbed preparation, Iowa 277.
- seedling blight, relation to mineral nutrition, 234.
- seedling types, grown in quartz sand, nutrient requirements, 491.
- silage, *see* Silage.
- sirup as sugar substitute for cakes, Colo. 884.
- sirup, dextrins isolated from, properties, Iowa 165.
- smut, growth types, relative effect of environmental and genetic factors, 811.
- smut resistance in strains, factors affecting, Iowa 228.
- stalk beetle, rough-headed, pest of young corn, rice, and strawberry, 252.
- strains, aphid infestation as index of susceptibility to corn borer attack, 252.
- strains, high- and low-protein, effect of soil N on protein in, Ill. 504.
- "striped dwarf," Fla. 806.
- sweet, *see* Sweet corn.

Corn—Continued.

- thiamin and riboflavin in, 148.
- tillage methods, efficiency in, Mo. 120.
- translocation gradients and relation to photosynthesis and yield, Iowa 191.
- translocations involving "B" chromosomes, 206.
- types for fattening steers, efficiency, Iowa 257.
- ultraviolet radiation in, genetic effects, 206.
- variety and hybrid performance, N.Dak. 216.
- variety tests, Fla. 791, Idaho 659, Ill. 504, Ind. 659, Ky. 792, Me. 213, Mo. 52, N.J. 366, N.Mex. 366, Pa. 504, S.C. 367, S.Dak. 504, Tenn. 367, Wash. 367, Wyo. 793.
- variety tests, lattice and triple lattice, Iowa 213.
- various portions, protein and vitamin values, Iowa 303.
- vascular system in, maceration method of demonstration, 358.
- wallaby ear disease, insect transmission, 812.
- with high moisture content, storage in small wire-sided bins, Ind. 725.
- yellow, carotenoid pigments in, separation and identification, 8.
- yellow, identification of compounds responsible for odor, Iowa 165.
- yield on farm terraces, distribution, 575.
- yield, prediction, climatological measurements for, 21.
- yield, reduction on cessation of manuring, Ill. 482.
- yield, relation to weather and its distribution, U.S.D.A., 340.
- yield tests, Iowa 215, Kans. 663.
- Corncrib, down-draft metal, 580.
- Cornell University notes, 324.
- Cornfields, control of weeds in, Iowa 863.
- Corn-silk fly on sweet corn ears, P.R. 605.
- Cornstalk(s)—
 - ash and residues, fertility value, Ill. 504.
 - fertility value, Ind. 659.
 - harvesting, equipment combinations for, 862.
 - harvesting, for industrial use, 862.
 - hemicelluloses of, 167.
- Cornstarch—
 - developing, microscopic examination, 328.
 - lipides, 327.
 - lipides, fatty acid composition at various stages of growth, 328.
 - oxidation, Iowa 165.
 - production, laboratory control techniques for, Iowa 165.
- Cornus* species, distribution, 32.
- Corpus(ora) luteum(a)—
 - and uterus, relation, [N.Y.]Cornell 47.
 - during normal oestrous cycle in rat, growth and regression, 501.

Corpus(ora) luteum(a)—Continued.

- of pregnant mice, effect of placenta on, 52.
- Corrosion pits, synthetic, and analysis of contents, 171.
- Corynebacteria* in domestic animals, Ky. 851.
- Corynebacterium*—
 - equi* in pigs in Australia, 570.
 - ovis* from mule deer in British Columbia, 110.
 - sepedonicum* n.comb., proposed name for potato ring rot organism, 383.
- Coryneum deljeirinkii*, host range and growth-temperature relations, 80.
- Coryza—
 - infectious, of poultry, control, 163.
 - inheritance of resistance to, Wyo. 788.
- Cost of living, cash, by size of income and size of family groups, Nev. 286.
- Cotinis nitida*, see June beetle, green.
- Ootoneaster horizontalis*, *Phytophthora ootoneaster* dark-berry of, 528.
- Cotton—
 - Acala, effect of irrigation treatments, N.Mex. 366.
 - Acala, strains, diameter of fiber in, 54.
 - as substitute roofing material, 163.
 - black arm-angular leaf spot infection, stubs, seed, and wind as sources, Ariz. 805.
 - boll diseases and insect pests, 807.
 - bolts, *Alternaria* infection of, Ariz. 805.
 - breeding, Ariz. 791, N.Mex. 366, P.R.U. 213, Tenn. 367.
 - breeding for increased oil and N in, Tenn. 663.
 - breeding with upland and sea-island, S.C. 367.
 - cooperative ginning associations, costs and savings to members, N.Mex. 434.
 - cultivation schedule for, Miss. 660.
 - culture tests, Tenn. 367.
 - diseases in North Carolina, U.S.D.A. 66.
 - Egyptian-type, pure-seed production, U.S.D.A. 509.
 - fertilizer and nutrition studies, S.C. 367.
 - fertilizer, increased nitrogen for, Miss. 52.
 - fertilizer tests, N.Mex. 366.
 - fertilizers other than nitrogen for, Miss. 774.
 - fiber(s)—
 - colorless plastids, formation of microscopic cellulose particles in, 42.
 - fineness of, measuring, 318.
 - living, formation of cellulose particles in, 318.
 - shrinkage and cell wall structure, 650.
 - technic and devices for measuring length and fineness, Tenn. 367.
 - flea hopper studies, N.Mex. 393, U.S.D.A. 88.
 - Fusarium* wilt, 234.
 - Fusarium* wilt resistance, Tenn. 378.
 - genetic studies, S.C. 367.

Cotton—Continued.

- gins, compression of cotton at, 432.
 gins, cooperative, reserves against short-season losses, U.S.D.A. 869.
 gin maintenance, U.S.D.A. 581.
 ginning, cost and profit in Texas, Tex. 132.
 ginning for pure-seed preservation, U.S.D.A. 863.
 growing, costs, labor requirements, and profits in, P.R.U. 284.
 grown on buckshot soils, cultural practices, Miss. 660.
 in wartime, Okla. 866.
 insect(s)—
 of California, Calif. 91.
 problem, poison program for, Miss. 695.
 research in Peru, 822.
 studies, 394.
 irrigation, duty-of-water studies, N.Mex. 429.
 irrigation experiments, Ariz. 791, N.Mex. 366.
 leafworm studies, N.Mex. 393.
 louse, notes, Tenn. 393.
 Moco, chromosome number and grouping, 44.
 on clay loam, irrigation requirements, Ariz. 509.
 pathogens, seed- and soil borne, isolation and infection tests, 74.
 pest, biology and control, Ariz. 819.
 production in Tennessee, history, Tenn. 289.
 protecting from insects and plant diseases, Okla. 248.
Rhizoctonia infection and symptoms on older plants, 812.
 role of summer legumes for, Miss. 52.
 root rot, Ariz. 805.
 root rot fungus, obtaining sclerotia of, 74.
 rotation studies, Fla. 792.
 rust in Arizona, U.S.D.A. 377.
 rust incidence, Ariz. 805.
Sclerotium wilt, Ariz. 805.
 sea-island, yield and quality, Fla. 792.
 seed, *see* Cottonseed.
 seedling diseases, S.C. 378.
 situation, reaction of producers to, Okla. 435.
 spacing in Yazoo-Mississippi Delta, Miss. 795.
 stem weevil parasites in India, biology and distribution, 400.
 stomatal behavior in, 32.
 sulfur forms and crop sequences, tests, N.Mex. 866.
 tillage and weed control, Miss. 216.
 upland, dwarf-red character in, 359.
 variety tests, Ariz. 791, Fla. 791, Ga. 216, Mo. 52, N.Mex. 366, Okla. 369, S.C. 367, Tenn. 367.
Verticillium wilt, 807.

Cotton—Continued.

- wilt-resistant and susceptible variety, mineral nutrition and *Fusarium vas-infectum* resistance in, S.C. 378.
 wilt-resistant lines of Super 7, self-pollination and selection, S.C. 378.
 wilt-resistant, variety tests, S.C. 378.
 yarn strength, relation to structure, Tenn. 367.
 yields—
 after rye and winter legume covers, S.C. 367.
 in India, effect of rainfall, 182.
 relation to soils in Casa Grande Valley, Ariz. 866.
 Cottonseed—
 delinted, depths of planting, Ariz. 791.
 hull plastics, utilization, 1.
 hulls, *Reticulitermes tibialis* in, 247.
 longevity, 216.
 meal—
 as protein source for chicks, Miss. 702.
 as substitute for skim milk in raising calves, Wyo. 842.
 comparative value as feed and as source of nitrogen, Miss. 52.
 feeding, effect on egg yolk discoloration, nature of, 840.
 in ration of pregnant ewes, 97.
 proteins, nutritive value, effect of autoclaving, 141.
 v. urea, tobacco crop-producing capacity, Conn.[New Haven] 796.
 oil, crude, gossypol determination in, 176.
 treatment, Miss. 235, N.Mex. 366, 683.
 Coumarin compound from sweetclover as anti-blood-clotting factor, 1.
 Country, *see* Rural.
 Cover crops—
 effect of time of plowing under, Ill. 514.
 variety tests, Fla. 791.
 winter, comparison, Tenn. 367.
 winter, effect on percolation and nutrient losses, S.C. 342.
 Cow(s)—*see also* Cattle and Helfer(s).
 age, live weight, and milk-energy yield, correction, 265.
 artificial insemination, effect of diluters and storage on fecundity of semen, 657.
 artificial insemination in, Mo. 47.
 beef, distillers' corn dried grains v. cottonseed meal for, Ky. 834.
 concentrate mixture for, effect of quality of protein in, [N.Y.]Cornell 104.
 concentrate mixtures for, value of ground whole grains v. byproducts feeds in, [N.Y.]Cornell 104.
 copper in blood of, 115.
 dairy—
 accuracy of live weights on pasture, 265.
 alfalfa silage v. Atlas sorgo silage for, Ariz. 841.
 cost of keeping per year, N.J. 434.

Cow(s)—Continued.

dairy—continued.

effect of rest periods on subsequent milk production, Ill. 562.

relative availability of carotene in rations for, Ind. 704.

replacements in New York, marketing, [N.Y.]Cornell 130.

value of molasses- and phosphoric acid-alfalfa silages in rations, 410.

fed hegari fodder and cottonseed meal, relative carotene and vitamin A in blood, liver, and butterfat, N.Mex. 411.

feeding to control vitamin A in butter, 105.

in Iowa cow-testing association herds, persistency and inheritance of milk and fat production, Iowa 263.

lactating and dry, course of fasting energy production curves in, Mo. 103.

measurements and weights in Cornell dairy herd, [N.Y.]Cornell 104.

milk production, *see* Milk production.

milking, closed barns v. open sheds for, Wyo. 842.

milking, silage types for, S.Dak. 563.

new feeding standards for, Ill. 562.

normal, effect of sulfanilamide, Pa. 569.

sterile or difficultly bred, attempt to restore fertility in, [N.Y.]Cornell 846.

udders, *see* Udder.

Cowpea(s)—

ascorbic acid in, factors affecting, 351.

curculio studies, S.C. 393.

mineral composition under various conditions, S.C. 371.

variety tests, N.Mex. 366.

Cowpox studies, 553.

Crab apple, vitamin C in, 605.

Crab meal—

research, Mass. 761.

v. fish meal for poultry rations, Mass. 887.

Crambus toparius, *see* Cranberry girdler.

Cranberry (ies)—

bog(s)—

clearing for replanting, caution on use of arsenicals for, 520.

control of weeds and shrubs by chemicals, Mass. 793.

frost protection by wind machine, Mass. 800.

fungicides for, Wash. 378.

San Jose scale injury to, dormant sprays for, Wash. 394.

weeds, effect of flooding to kill root grubs, Mass. 793.

bordeaux pyrethrum spray for, time of application, 241.

breeding, Wash. 372.

disease control in wartime, 541.

false blossom-resistant strains, development, Mass. 800.

Cranberry (ies)—Continued.

false blossom virus in dormant vines, failure to inactivate by heat, 816.

fertilization, N.J. 371.

fruitworm control, Mass. 820.

girdler control, Mass. 820.

harvesting and handling, U.S.D.A. 224.

insects affecting, Mass. 820.

irrigation requirements, Wash. 372.

products research, Mass. 760.

root grub, notes, Mass. 820.

sanding experiment, 241.

syrup, vitamin C in, 605.

storage studies, Mass. 859.

tipworm studies, Wash. 394.

vine injury, relation to oxygen in winter flooding water, Mass. 800.

Crauc flies of George Reserve, Mich. 552.

Cream—

changes in demand in New York metropolitan area, [N.Y.]Cornell 120.

containing sodium chloride, danger in applying Babcock test to, Idaho 703.

farm, determining quality, criteria for, Ky. 842.

for buttermaking, quality, improvement, Iowa 264.

frozen, maintaining quality in, Pa. 563.

frozen, methods of storing, Fla. 842.

holding in buying station, effect on mold content and quality, 415.

market, bacteriological study, 107.

mold development in, laboratory studies, 414.

mold growth in, factors affecting, Ind. 415, 704.

pasteurized, effect of handling and aging, 104.

phosphatase value, effect of flash pasteurization and subsequent treatment, 415.

plants, losses in, relation to errors in Babcock test, 707.

prices paid for, in various large cities, Idaho 720.

quality control program of Boston Health Department, 104.

route organization and operation, Iowa 283.

salt-treated, testing, danger of hydrochloric acid gas poisoning, 337.

separating methods, relation to quality when marketed, Ind. 704.

Creamery (ies)—

Iowa, butterfat losses in, determination, Iowa 264.

license division report, Ind. 414.

water supplies, bacteria in, N.Dak. 707.

Oreontia *femorata* on cotton, biology and control, Ariz. 819.

Crepis, systematics, cytogenetics, and evolution in, 487.

Cricket—

mole, control, U.S.D.A. 88.

mole, parasites in Trinidad, 97.

Cricket—Continued.

Mormon, new parasite of, 403.

Mormon, studies, U.S.D.A. 88.

southern mole, on cigar-type tobacco in South, U.S.D.A. 394.

Crime patterns in rural South Dakota, 738.

Crioceris asparagi, see Asparagus beetle.

Cronartium—

coleosporioides, notes, 390.

ribicola, see White pine blister rust.

Crop(s)—

boron requirements, 346.

boron toxicity to, Ariz. 805.

diseases in Venezuela, survey, 229.

fumigation with methyl bromide and HCN, Fla. 799.

growth and yield, factors affecting, Iowa 182.

harvesting costs with combines of different sizes and types, Ill. 583.

high in protein, silage production from, [N.Y.]Cornell 104.

improvement, [N.Y.]Cornell 33, 68.

in rotation, effects of fertilizers, manure, and green manure, Ariz. 791.

in rotation, fertilizer tests, Ind. 659.

nutritional needs, plants as indicators, tests, 196.

of Puerto Rico, nutrient requirements, P.R.U. 184.

on different soil types, potash requirements, [N.Y.]Cornell 23.

or cutworms, Utah 696.

pests, work in Philippines, 90.

plants, root development, factors affecting, Wis. 505.

plants, seed treatment, methods and materials, Miss. 382.

production, machine and hand methods in, U.S.D.A. 297.

production, value of organic matter, Idaho 632.

reports, U.S.D.A. 299, 444, 586.

residues, value in soil, S.Dak. 483.

response to lime, manure, and fertilizers on different soil types, Iowa 183.

response to magnesium on Alabama soils, 775.

response to potassium fertilization, Iowa 183.

rotations, see Rotation of crops.

seeds, treatment, Miss. 681.

threshing with small combine, Idaho 725.

wireworm injury and effect of crop rotation, 253.

yields and quality, effect of excessive liming, Ky. 769.

yields and weather, U.S.D.A. 20.

yields, effect of burning off weeds before plowing, Fla. 792.

yields on terraces, Wis. 433.

yields, regression of on weather, methods of computing, Iowa 766.

Cropland, abandoned, in Cedar Creek area, revegetation, Mo. 794.

Crotalaria rotation studies, Fla. 792.

Crown-gall organism, polysaccharide produced by, 681.

Crucifer club root control, mercurials for, Mass. 807.

Crucifer diseases in North Carolina, U.S.D.A. 66.

Cryolite, synthetic and natural, assimilation of fluorine by rats from, 143.

Cryptoxanthin in yellow corn, determination, 8.

Cucumber(s)—

beetle—

spotted, studies, 391, Mo. 85.

striped, studies, Me. 248, Mo. 85.

studies, Ind. 694.

breeding for disease resistance, [N.Y.] Cornell 57.

copper dusts for, Mass. 807.

culture, U.S.D.A. 515.

downy mildew—

dusting for, Fla. 806.

resistance, 386, 787.

resistance, breeding for, S.C. 371, 378.

resistant variety, development, P.R.U. 229.

fermentation, bloater formation in, 19.

fertilizers for, S.C. 371.

fresh and pickled, nutritive value, 18.

growth, effect of root temperatures, Mo. 57.

mosaic resistant variety, development, P.R.U. 229.

mosaic strains on tobacco in Ontario and Quebec, 687.

physiological processes in storage, effect of waxing, 447.

pickle fermentations, gaseous products of, 18.

pickle, fresh, manufacture, bacteriological study, 18, 19.

polyploids in, 787.

Puerto Rico No. 39, P.R.U. 373.

salted, quality, determination with pressure tester, 18.

salting, 18, 19.

seed treatment, Mass. 800, N.Y.State 222.

varieties, N.Mex. 371.

viruses 3 and 4, aromatic amino acids in, 384.

virus 4, preparation and properties, 385.

yield and quality, effects of climatological factors, 18.

Cucumis genus, polyploids in, 787.

Cucurbit—

diseases in North Carolina, U.S.D.A. 66.

ovary developing, rates of cell division in various parts, 650.

seed globulins, 744.

Cucurbita, nuclear size in, 31.

Culex pipiens, vectors of St. Louis encephalitis virus, 711.

Culture media—

aseptic handling, simple technic, 809.

preparation, manual of methods, 34.

Culture media—Continued.

sterile, and bacterial cultures, bactericidal substances from, 34.

Curculio control with insecticides, 305.

Curculionids affecting chufa, 95.

Ourinus sp., scale predator, notes, P.R. 695.

Currant(s)—

black, leaf midge, 402.

black, vitamin C in, 605.

cultivated red, production of sporidia of *Cronartium ribicola* on, 818.

insects, life history and control, Wash. 92.

tomato ring spot on, 691.

varieties, N.Mex. 371.

Currency depreciation, effects on prices, production, and foreign trade, [N.Y.]Cornell 876.

Cutworm(s)—

army, notes, U.S.D.A. 88.

army, outbreak in Utah, 247.

biology and control, [N.Y.]Cornell 90.

on cigar-type tobacco in South, U.S.D.A. 394.

or crops, Utah 696.

pale western, U.S.D.A. 88.

research, Ind. 604.

Cyclamen mite, studies, Ill. 546, U.S.D.A. 88.

Cylas formicarius elegantulus, see Sweet-potato weevil.

Cylindrocopturus eatoni on pine, biology, 253.

Cylindrosporium leaf spot on red raspberry, U.S.D.A. 805.

Cyllene robiniae, see Locust, black, borer.

Cyperus rotundus, response to five moisture levels, 782.

Cypress, Arizona, frost injury artificially induced in, 67.

Cyrtorhinus fulvus for control of taro leaf-hopper, 89.

Cystoercus tenuicollis in squirrels, 419.

Cystine—

added to casein diets, lactation-promoting properties, 592.

synthesis in vivo, 744.

Dahlia—

root storage and insect control, Ga. 64.

variety test, Ga. 64.

Dairy—

Association, Weber Central, economic analysis, Utah 733.

barn, concrete, temperature, humidity, and air movement in, Ind. 725.

cattle and dairy cows, see Cattle and Cow(s).

engineering, 728.

farm management—

and costs in Pennsylvania, Pa. 437.

in Champlain Valley and relation to price level, Vt. 871.

study, [N.Y.]Cornell 130.

farms—

economic importance of raising replacement stock, N.J. 410.

returns on, Wyo. 867.

Dairy—Continued.

feed prices and World War II, [N.Y.]Cornell 130.

herd(s)—

Holstein, improvement through continuous use of proved sires, Wash. 411.

improvement work, N.J. 360.

profits from, La. 290.

purebred, improvement through continuous use of proved sires, Tenn. 411.

Industry in United States, bibliography, U.S.D.A. 436.

marketing in Oklahoma, Okla. 730.

molds, relative gas requirements, Wash. 411.

production and consumption, defense program in regard to, 104.

products—

copper content, relation to quality of finished product, Ind. 704.

cost of production, reducing, Mo. 733.

desirable bacteria in, stimulating growth of, Pa. 563.

fluorescent bacteria in, 847.

gallon weights, calculation, 850.

in diet, place of, 104.

marketing, Ind. 730.

of Iowa, standardization, Iowa 264.

standard methods for examination, 106.

suitability for frozen-pack methods, Wash. 411.

volume hauled per mile, relation to cost of hauling, Ill. 584.

rations—

adequacy of calcium and phosphorus supply in, Fla. 842.

comparative value, Iowa 263.

research—

at Reading, progress in, 104.

in Scotland, 411.

Science Association, American, meeting, 612.

sires, see Bull(s) and Sires.

Dairying—see also Creamery(ies), Butter, Milk, etc.

in Mexico and Cuba, N.Y.State 842.

in southern New England, competitive position, U.S.D.A. 290.

principles, treatise, 841.

Damping-off control, seed and soil treatment for, La. 810.

Dandelion control, dichloroethyl ether test for, Ky. 702.

Darbya, inferior ovary, anatomy, 31.

Dark adaptation—

among roentgenologists, biophotometric measurements, 313.

measurement with adaptometer, 741.

of high school children at different income levels, 743.

physiologic and clinical considerations, 599.

- Darso foot and root-rot disease, effect of soil conditions,** 683.
- Dasyneura tetensi* on black currant,** 402.
- Date(s)—**
 composition, effect of fertilizer treatments, 522.
 deterioration, 522.
 maturation and storage, Ariz. 799.
 palm, carbohydrate changes during summer, 522.
 pollen, cold storage of, 522.
 spoilage, aeration a factor in reducing, 523.
 variety tests, Ariz. 799.
 water injury, relation to water supply from palm to fruit, 522.
- Datura*—**
 embryos, small, cultivation in vitro, 781.
 stramonium, ovule formation, contribution of three germ layers to, 31.
- Day length, see Photoperiodic.**
- Death-watch beetle, duration of larval stage, relation to nitrogen metabolism,** 400.
- Deer—**
 preference for different forest species, Pa. 524.
 Virginia, parathyroid gland of, at different seasons, 655.
- Defense—**
 financing and economic effect on agriculture, Iowa 283.
 National, and rural public assistance, 739.
- Deficiency diseases, see Diet deficiency and specific diseases.**
- Deguelin, color reaction, adaptation to photoelectric colorimeter,** 397.
- Delaware Station report,** 322.
- Delphinium ajacis*, *Sclerotinia* stem rot on,** Mo. 67.
- Delphinium, soil and nutrient requirements for,** [N.Y.]Cornell 64.
- Democracy, challenge to,** Iowa 445.
- Dendroctonus monticolae*, see Pine beetle, mountain.**
- Department of Agriculture, see United States Department of Agriculture.**
- Dermacentor*—**
albipictus, see Tick, winter.
variabilis, see Dog tick, American.
- Dermatitis—**
 in pyridoxin-deficient rats, 457.
 in rats, and vitamins affecting, Mo. 147.
- Dermatology, vitamins in,** 600.
- Dermatosis, scaly, of chicks and biotin,** 703.
- Dermestid larvae injurious in dwelling houses,** [N.Y.]Cornell 90.
- Derris*—**
elliptica, sugar determination and carbohydrates and toxic constituents in, P.R. 617.
 roots, toxic constituents in, relation to carbohydrates, P.R. 617.
 spp., culture and handling, P.R. 668.
 tissue patterns, effects of weather cycles on, P.R. 646.
- Desert—**
 research covering Chihuahuan and Sonoran deserts, 485.
 soils, nutrients and exchangeable bases of, effect of irrigation waters and cropping, N.Mex. 635.
 soils, redox potentials under varying conditions of sterilization, 771.
 soils, soil profiles of, effect of irrigation and cropping, N.Mex. 343.
 vegetation of North America, 487.
- Desserts, frozen, sanitation, neglected phase of,** 850.
- Deuteromycetes, new Colombian,** 807.
- Devil's shoestring, roots, rotenone content, inheritance,** 249.
- Dewberries—**
 culture, N.Y.State 376.
 double blossom disease, reduction, N.J. 377.
- Dextrinic acids, methylation, Iowa** 165.
- Dextrins—**
 isolated from corn sirup, properties, Iowa 165.
 Raman spectra, Iowa 165.
- Dextrose studies, Mass.** 761.
- Diabetes in children, effect of adding vitamin B complex to diet,** 601.
- Diabrotica*—**
duodecimpunctata, see Cucumber beetle, spotted.
longicornis, see Corn rootworm.
vittata, see Cucumber beetle, striped.
- 4:4'-diamidino diphenoxy pentane, delayed poisoning by,** 113.
- 2,4-diaminodiphenylamine, fungicidal properties,** 681.
- Diaphania nitidalis*, see Pickleworm.**
- Diaporthe vexans* n.comb., proposed name,** 538.
- Diarrhea—**
 infantile, ascorbic acid absorption in, 460.
 of calves, filtrable virus from, 568.
- Diatraea*—**
 borers for rearing parasites, P.R. 695.
mauriciella, biological control, 696.
saccharalis, see Sugarcane borer.
 spp. parasite in Trinidad, 552.
- Dibenzanthracene, of alcohol and of other agents, effect on vitamin A in rat,** 892.
- Diotycaulis flaria* in sheep on irrigated pastures, Oreg.** 856.
- Dieffenbachia*, *Cephalosporium* leaf spot of,** 82.
- Diet(s)—see also Food(s) and Nutrition.**
 balanced, nutritive value, 589.
 calcium-low, and bone fractures, 595.
 deficiency—
 diseases, high lights on, 258.
 effect on periodontal tissues of guinea pig and of man, 598.
 human, in selected counties, Fla. 880.
 in quantity in Puerto Rico, P.R.U. 284.

- Diet(s)**—Continued.
 effect on blood level and adaptation to dim light, 312.
 iron determination in, 761.
 low in minerals, effect on intestinal stasis, 594.
 prenatal, effect on mother and child, 593.
 synthetic, supplemented with all known vitamin B factors, inadequacy for mice, 749.
- Dietary**—
 fiber, effect on secretory activities of alimentary tract, 453.
 requirements for fertility and lactation, 592.
- Diethylene glycol monoethyl ether**, determination, 477.
- Diethylstilboestrol**—
 action on adrenalectomized and hypophysectomized rats, 654.
 artificial induction of lactation in virgin animals by, 845.
 effect on reproductive organs of female guinea pigs, 655.
 injections, effect on growth of male guinea pig mammary gland, 845.
- Dihydrorotenone**, color reaction, adaptation to photoelectric colorimeter, 397.
- Dill pickles**, pasteurization, 2, 18 19.
- Dilophus febrilis*** larvae in lawns, methods for control, 552.
- Dinitrocresol** and other dual purpose winter washes, 396.
- Dinitro-o-cresol** as eradicator spray for fruits, U.S.D.A. 377.
- Dinoderus minutus***, biological studies and control, P.R. 695.
- Diphenylamines**, fungicidal properties, 681.
- Diphtheria**, avian, new treatment for, P.R.U. 858.
- Diplodia***—
 forms resembling *D. frumenti*, comparative study, Fla. 806.
frumenti, notes, 234.
natalensis and *Phomopsis citri* as cause of citrus disease, comparative behavior, 542.
 spp. on corn, physiological studies, 73.
zeae dry rot of corn, Iowa 228.
zeae, mode of entrance into corn ears, 383.
- Disease(s)**—
 deficiency, *see* Diet deficiency diseases and specific diseases.
 of animals, *see* Animal diseases and specific diseases.
 of plants, *see* Plant diseases and specific host plants.
 transmission by airplane, possible dangers, 93.
- Dissection**, fine needles for, 627.
- Distemper**—
 canine, in a zoological park, epizootic, 858.
 inclusions, improved diagnostic stain for, 858.
- Distillers' waste** as protein supplement for poultry, Wis. 555.
- Ditylenchus dipsaci***—
 nematocides for, 78.
 notes, 389.
 on *Trifolium pratense*, U.S.D.A. 527.
- Dodder**—
 in Ispedeza, control, Kans. 217.
 on petunia, U.S.D.A. 805.
- Dog(s)**—
 blood building in, effects of cobalt and liver substance, 718.
 blood cytology, effect of hyperplastic endometritis on, 117.
 expression of different types, genetic and endocrine basis, 211.
 feeds, inspection and analysis, Ky. 100.
 flies, studies, U.S.D.A. 89.
 pantothenic acid deficiency studies in, 558.
Strongyloides, occurrence and diagnosis, 274.
 tick, American—
 experimental transmission of St. Louis encephalitis to white Swiss mice by, 567.
 parasite of, 553.
 rickettsial infections in, knowledge necessary for study, 90.
 tick, brown—
 transmission of Q fever by, 111.
 transmission of tick-bite fever by, 851.
 vitamin B₆ deficiency in, 147.
- Dove**—
 mourning, ecology and management, Iowa 245.
 western mourning, ecology and management, Iowa 245.
- Downy mildew** fungi spore dispersal, mechanism, 536.
- Draeculacaphala portola***—
 notes, 93.
 vector of chlorotic streak of sugarcane, U.S.D.A. 88.
- Drainage**—
 and flood-control engineering, 575.
 as conservation practice, 576.
 control in northern Everglades, 429.
 ditches, open, maintaining by grazing, 861.
- Dress fabrics**, all-silk and all-rayon, physical properties, 754.
- Drinking utensils**, sanitary quality, methods for determining, Mass. 760.
- Drosophila***, genetics of, 363.
- Drosophila***, mutation in, 44.
- Drought**—
 effect on movement of soil nitrogen, Ga. 770.
 effects, persistence, N.J. 342.
 in Queensland during the 50-year period, 767.

Drug(s)—

effect on motility of bovine rumen, 853.
plants, native to Great Britain, 643.
plants of San Salvador, 194.

Duck(s)—

baby wood, paratyphoid in, 277.
diving, spring flight through Iowa, 86.
egg-laying, commercial significance, N.J. 360.
egg laying of, as enforced relaxation oscillation, 841.
feeding, wartime, 837.
pintail, *Hymenolepis mastigopraedista* from, 419.
ruddy, nesting, in Iowa, 246.
studies, Iowa 245.
tarsometatarsus, relative growth, 790.
wild, food plants, value, propagation, and management, 86.

Dusts—

as supplement to sprays to meet labor shortage, N.Y. State 323.
settling rate and fractionation, apparatus for study, 68.
settling rates of diluents in, Conn [New Haven] 822.

Dutch in Michigan, religion and assimilation of, Mich. 301.

Earth, rammed, walls, experiments in use, S. Dak. 573.

Earthworms, North American, check list and bibliography, 86.

Earwig—

European, natural enemies of, U.S.D.A. 83.

ring-legged, life history and habits, 399.

Easter lily bulbs, storage and forcing performance, 64.

Eating and drinking utensils, cleansing, effectiveness of detergents and procedures for, Mass. 760.

Echinophaga—

gallinacea, see Sticktight flea.

myrmecobii, life history and artificial breeding, 96.

Echinocystis, nuclear size in, 31.

Echinodontium tinctorium brown stringy rot on western hemlock, 543

Echinoparyphium aconiatum from intestine of ruffed grouse, 86.

Ecology, including adaptation and origin, 485.

Economic conditions in Yakima Valley, Wash. 436.

Ectoparasite-host records from Sierran region of California, 248.

Egg(s)—

albumin, see Albumin, egg.

consumption deficiency in Puerto Rico, P.R.U. 284.

content of alimentary pastes, determination, 336.

cooling and holding on farm, mechanical refrigeration for, Ind. 725.

cooling on farm and at grading stations, U.S.D.A. 127.

cooperative marketing, survey, Mich. 875.

Egg(s)—Continued.

cost of production, Ariz. 869.

farmers, monthly yield standards, N.J. 360.

formation in various sections of oviduct, physiology of, Ill. 496.

frozen, preparation, storage, and use, 882.

frozen, suitability for cake baking, 883.

hatchability, factors affecting, Mo. 99.

hatchability, role of pantothenic acid in, [N.Y.] Cornell 99.

hen's, maturation, fertilization, and early cleavage in, 658.

incubated, value and methods of feeding to pigs, 101.

incubation of, changes in form of inositol during, 841.

infertile, early detection, [N.Y.] Cornell 47.

inspection service, Federal-State, Ind. 730.

market, cost of production, Md. 561.

marketing, cooperative, in Kansas, Kans. 295.

markets, retail, in Indiana, Ind. 730.

meats, liquid, during processing, detection of bacteria in, 882.

of one hen, feed purchasing power of, Mo. 99.

percentage fertility, relation to time of insemination, 658.

prices, effect of size and interior quality, Ohio 586.

processed in mineral oil, cooking properties, 882.

production—see also Hens, laying.

and hatchability, effect of alfalfa leaf meal and dried cereal grass, 840.

and hatchability, effect of ultraviolet light v. cod liver oil ration, Mich. 262.

best hatching season for, N.J. 403.

costs and returns and effect of hen mortality on, Ill. 584.

different kinds of housing for, Wyo. 834.

effect of feather mites on, Mo. 85.

effect of temperature and ventilation, Ind. 698.

electric light for, 108, 278.

energy efficiency, Mo. 99.

improving, effectiveness of progeny testing for, N.J. 860.

in poultry, relation to protein, Wyo. 834.

intensity, inheritance of, Mass. 788.

percentages of protein for, S. Dak. 554.

profit calculator, Ariz. 448.

quality—

and consumers' preferences, relation to egg-grading practices, Iowa 321.
preservation by farm refrigeration, 841.

Egg(s)—Continued.

quality—continued.

relation to grain varieties, S.Dak.
554.record, individual, improved inexpensive,
211.riboflavin deficiency in, effect on embry-
onic development, 700.room, evaporative, cooler and humidifier
for, 278.

size—

and quality, biological efficiency of
protein fractions on, Iowa 257.

inheritance of, Mass. 789.

large and small, breeding for, Ariz.
788.

physiology of, 364.

storage, bibliography, U.S.D.A. 703.

technic for photographing early cleavage
stages, 627.uniformly rich in vitamin D, production,
Iowa 256.white, raw, toxicity, explanation of, 312.
yields calculation by commercial farmers,
N.J. 360.

yolk—

discoloration produced by cotton-
seed meal, nature of, 840.fat during incubation, relation to
hen's ration, Ky. 834.

formation, physiology of, 50.

Eggplant—*Phomopsis* blight and fruit rot, Fla. 806.
tip-over disease, perfect stage of fungus
causing, 538.**Eggshell** quality, effect of minerals, vitamins,
and storage, Wash. 404.***Egulus platycephalus*—**effective against bamboo scales, P.R. 695
shipment of adults to Haiti, P.R. 695.***Eimeria*—***ah-sa-ta* n.sp., description, Wyo. 273.*antilocaprae*, new coccidium from Amer-
ican antelope, 418.*crandallis* n.sp., description, Wyo. 273.*neoleporis* n.sp. in cottontail and trans-
missible to tame rabbit, 566.*nieschulzi* growth-promoting potency of
feeding stuffs, 270.*tenella* infection in chickens, ineffective-
ness of cow urine in control, 720.*tenella* infections, period of protection
afforded by sulfur, 418.**El Cerrito**, typical Spanish-American com-
munity in New Mexico, U.S.D.A. 587.***Elaemosoma petulans*** n.sp., description, 403.**Elastic** yarns, types, manufacture, 753.**Elastin** in animal tissues, determination,
rapid method for, Iowa 256.**Elderberry**, vitamin C in, 605.**Electric—**current on rural lines, increase in con-
sumption, Ill. 573.fences, insulating supports for, types,
[N.Y.]Cornell 120.**Electric—Continued.**mixers and beaters for household use,
Ind. 754.

power, irrigation pumping with, 279.

Electrical equipment for farm, building, 578.**Electricity** uses on Washington farms, 278.**Electrification—**

farm, needs of, 278.

rural, rank in New Jersey, N.J. 428.

Elements, minor—

absorption and excretion by man, 748.

in soils, tests for need of, Ky. 769.

relation to nutrition, 491.

Elevator(s)—

centralized, radius of operation, Ill. 584.

farmers', of Iowa, business stability,
U.S.D.A. 296.**Elm(s)—**American, epidemic dying due to phloem
necrosis, U.S.D.A. 692.

aphid, woolly, predator on, 247.

bark beetle(s)—control, toxic and repellent sprays
for, U.S.D.A. 832.smaller European, feeding injuries,
reactivation of Dutch elm disease
fungus by, 833.smaller European, technic for arti-
ficially feeding fungus spores and
other substances, 92.trapped in chemically treated trees,
U.S.D.A. 88.borer, technic for artificially feeding fun-
gus spores and other substances to, 92.**Chinese—***Chalaropsis* root rot of, 389.

disease of, 245.

strength properties, 079.

disease, Dutch—

and insects, Mass. 820.

control program, relation to bark
beetle on apple trees, 550.

eradication, U.S.D.A. 66.

pathogenesis and control, Conn.
[New Haven] 805.relation to *Scolytus sulcatus* and
apple trees, 389.spread by *Scolytus multistriatus* and
control, Mass. 806.

studies, [N.Y.]Cornell, 67.

diseases, notes, Mass. 806.

insects in United States, annotated list,
U.S.D.A. 92.

leaf beetle, notes, Tenn. 393.

phloem necrosis disease, insect vectors,
U.S.D.A. 88.

scale, European, notes, Ill. 546.

Elsinoe*—hansfordii* n.sp., description, 530.

new species from Brazil, 70.

parthenoclasti n.sp., description, 389.**Embryonic** material, amyl acetate as clearing
agent for, 629.**Embryos** of pregnant rats, effect of thyro-
tropic hormone on, 503.

Empoasca—*fabae*, see Potato leafhopper.*filamenta* control, Idaho 694.*maligna*, see Apple leafhopper.**Encephalitis—**

human, and equine encephalomyelitis, 110.

human, caused by equine type of virus in Minnesota, 274.

in cattle, diseases causing, 568.

in red fox in Ohio, 719.

St. Louis—

and human equine encephalomyelitis, 566.

experimental transmission to white Swiss mice by American dog tick, 567.

virus, experimental and natural in horses, 717.

virus, transmission by *Culex pipiens*, 711.

western equine and St. Louis types, epidemiological aspects, 117, 717.

Encephalomalacia in chicks, cause and prevention, [N.Y.] Cornell 99.**Encephalomyelitis—**

avian, Mass. 858.

canine, 425.

equine—

and human encephalitis, 110.

cerebral resistance to, relation to neutralizing antibodies in cerebrospinal fluid, 717.

experimental, significance of neutralizing antibody in, 566.

in Massachusetts, 117.

in United States in 1941, 857.

studies, 117, 274.

susceptibility of golden hamster to, 718.

virus and antiserum, neutral mixtures, effect of dilution, 566.

virus protein, effect of ultraviolet light, 424.

western type in humans, 852.

human equine, and St. Louis encephalitis, 566.

sporadic bovine, 713, Tex. 854.

transmission experiments from horses to guinea pigs, 419.

Endoconidiophora adiposa, decomposition of lignin fraction of sulfite waste liquor by, 85.**Endocrine—**

glands, role in growth, reproduction, and lactation, 789.

system and hormones, 498.

Engineering—

agricultural—

case for, 609.

in national defense, 427.

research in Great Britain, 756.

biological, case for, 609.

dairy, 728.

in wartime agriculture, 572.

Engineering—Continued.

laboratory instruction, unit-operations method, 445.

Enoclerus sphaeus, predator of mountain pine beetle, 95.**Enteritis—**

infectious catarrhal of turkeys, transmission and prevention, 426.

nonspecific, of chickens, and fowl leucosis, radiant energy in study, Iowa 270.

swine, sulfaguanidine in treatment, 423.

Enterobius vermicularis eggs exposed to household fumigants, survival, 419.**Enterohepatitis**, infectious, see Blackhead.**Enterotoxemia** of lambs, studies, 116.**Entomological—**

problems of Pacific area of interest to medical entomologists, 89.

service, insecticidal problems, 545.

stations in Ecuador, gazetteer, 392.

survey of Micronesian Islands under Japanese mandate, 89.

Entomology—see also Insect(s).

Philippine, survey, 89.

Entyloma n.sp., description, 381.**Enzymes—**

and fermentation, chemistry of, and Liebig, 616.

and trace substances, 471.

Enzymology and related subjects, advances in, 471.**Eosinates**, their spectra and staining capacity, 629.**Eperythrozoon wenyon** bodies in blood of cattle, 272.**Ephedra sinica**, cultural and assay tests, S.Dak. 504.**Ephestia—***cautella*, see Almond moth.*clutella*, see Tobacco moth.*kuehniella*, see Flour moth, Mediterranean.**Epiblema—***otiosana* parasite, Va. 824.*strenuana* parasite, Va. 824.**Epilachna varivestris**, see Bean beetle, Mexican.**Epiphytes**, parasites, and geophytes, production of alkaloids and cyanogenetic and organic sulfur compounds, 68.**Epitritimerus hystrix** on timothy, 833.**Epitritia—** *cucumeris*, see Potato flea beetle. *parvula*, see Tobacco flea beetle. *subcrinita*, see Potato flea beetle, western.**Equidae**, crystalloids in hypophysis, 655.**Equines**, nutritional diseases, 274.**Ergot**, artificial production, 232.**Eriophyes—** *castigi*, studies, U.S.D.A., 88. *sheldoni* control, 403.**Eriosoma—** *americanum*, see Elm aphid, woolly. *lanigerum*, see Apple aphid, woolly.

Bristalis tenax genital myiasis in a cow, 421.
 Erosion, *see* Soil erosion.
 Erwineae, serological studies, 70.
Ervinia—
 aroidae, causing poppy bacterial soft rot, 83.
 carotovora, fermentative ability, 71.
 phytophthora, notes, 236.
Erysipelothrix rhusiopathiae growth requirements, 711.
Erysiphe—
 cichoracearum, resistance of phlox to, 388.
 polygona, conidia, development, structure, and germination at low humidity, 70.
 Erythrocytes—
 hen, preparation of living nuclei from, 720.
 of cattle, additional antigens in, 854.
Erythroneura, *see* Grape leafhopper.
Escherichia—
 acidi lactici, pathogenicity for turkeys and response to agglutination test for pullorum disease, 723.
 and *Aerobacter*, tests for differentiation, [N.Y.]Cornell 33.
 coli—
 aging without reproduction and viability of young cells, 776.
 bacteriophages active against, morphology and particle diameter, 644.
 lethal effect of drier rolls on, 348.
 use in determination of vitamin C, 623.
 Ethyl—
 carbamate, effect on respiration of yeast, 201.
 methacrylate as medium for mounting embryos and small adults, 628.
Euborellia annulipes, *see* Earwig, ring-legged.
Euetheola rugiceps, *see* Sugarcane beetle.
Euphorbia—
 chromosome number relationships in genus, 31.
 spp., response to photoperiod and temperature, effect of light intensity, 225.
Eutettix tenellus, *see* Beet leafhopper.
Euzesta stigmatias, notes, P.R. 695, P.R.U. 394.
 Evaporation—
 from land and water surfaces, measurement, U.S.D.A. 340.
 measure of, 632.
 micro-, apparatus for, 331.
 Evergreen(s)—
 hardiness, factors affecting, Mass. 800.
 seedlings, inoculation with mycorrhizal fungi, Wis. 524.
 Evolution and genetics in light of religion, 206.
 Ewe(s)—*see also* Sheep.
 bred first as lambs v. ewes bred first as yearlings, performance, 210.
 breeding, deficiencies of nonleguminous roughages for, 98.

Ewe(s)—Continued.
 breeding, winter rations for, Ind. 698.
 gummer, fattening, 97.
 in lambing camp, rations for, Wash. 835.
 lambing, effect of gonadotropic hormones, Tenn. 350.
 native mountain and northwestern, comparison, Tenn. 360.
 ovarian changes during oestrus and ovulation, Mo. 47.
 pregnant—
 blood copper of, 361.
 comparative rations for, S.Dak. 554.
 cottonseed meal in ration of, 97.
 rye v. bluegrass and alfalfa hay v. red clover hay for, Ky. 834.
 treatment of with phenothiazine, 570.
 range, selection, importance of body weight in, 97.
 rations for, Wash. 404.
 reproduction of, effect of nutrition, Okla. 700.
Ezochomus foudanti, new predator of bamboo scale, P.R. 695.
 Experiment station(s)—
 data, statistical investigations, Iowa 213.
 in 1941, editorial, 613.
 organization list, U.S.D.A. 880.
 report, 755.
 seed shipments to Russia, 756.
 significant findings of, editorial, 1, 161.
 Extension work, cooperative, relation to national defense and security, U.S.D.A. 136.
 Fabric(s)—*see also* Textile.
 antcrease finish for, discussion, 463.
 cotton, linen, and rayon-mixed, physical properties, 310.
 mixed, analysis, method adapted for, 463.
 quality, judging, U.S.D.A. 608.
 wool and part wool, effect of wear on, S.Dak. 608.
Fabriciella n.spp., descriptions, 553.
 Factor Z_1 —
 and hypoxanthine, identity, 645.
 as growth substance of *Phycomyces*, 194.
 Family(ies)—*see also* Farm family(ies).
 assets and liabilities of, changes in, U.S.D.A. 158.
 classification summary, Nev. 280.
 expenditures for—
 clothing, U.S.D.A. 158.
 education, reading, recreation, and tobacco, U.S.D.A. 897.
 housing and household operation, U.S.D.A. 159.
 personal care, gifts, selected taxes, etc., U.S.D.A. 159.
 farm and village of Vermont, incomes and expenditures, 164.
 finance in wartime, home economists' responsibilities, 754.
 food consumption and dietary levels, U.S.D.A. 136.
 German worker, food consumption, U.S.D.A. 284, 307.

Family(ies)—Continued.

income and expenditures, U.S.D.A. 321, 608.

living cost on farms, Mo. 129.

living, farm contribution toward, Wash. 158.

low-income, effect of low-priced milk program on consumption of milk and dairy products, U.S.D.A. 591.

of Columbia, income, Mo. 158.

of rural South Dakota, migrants from, geographical and occupational distribution, S.Dak. 737.

poorly housed, as social problem, Pa. 300, 586.

rural, social adjustment of members Iowa 300.

rural, social participation, [N.Y.]Cornell 136.

Fans, attic, installation and use, 282.

Farm—

accounting, Mo. 129.

accounts on New York farms, [N.Y.] Cornell 129.

accounts, summary, Nev. 287.

American, architectural homes for, 434.

animals, *see* Livestock and Animal(s).

building(s)—

construction, earth stabilized with emulsified asphalt for, suitability, Ind. 725.

construction, plywood, steel, and lumber in, Iowa 277.

floors, tests of new materials and methods for, S.Dak. 573.

losses due to wind and fire, Iowa 277.

problems, U.S.D.A. Extension Service aid to, N.J. 428.

service for Southwest, 282.

spray painting of, 866.

business—

in Essex County, diversification, Mass. 866.

in Tompkins County, [N.Y.]Cornell 129.

records, summarizing, Ill. 583.

studies, summaries, Nev. 286, S.C. 287, U.S.D.A. 286.

chemical warfare on, N.Y.State 323.

crops, chemical content, importance, Ill. 504.

dairy, large and small grinding units for, analysis, 126.

electricity on, *see* Electricity.

family(ies)—*see also* Family(ies).

effects of war, 609.

income, indebtedness, and expenditures, Ill. 583.

incomes and expenditures, Iowa 321.

living, sociological research in, 587.

meeting living needs in five type-of-farming areas, U.S.D.A. 435.

of South Carolina, food consumption, S.C. 451.

textile materials used for household purposes by, S.C. 608.

Farm—Continued.

family(ies)—continued.

with loans from Farm Security Administration, net income, cost of living, etc., Ariz. 866.

fence construction, Iowa 277.

fire risks, classification and rating, U.S.D.A. 439.

fish ponds, management, Ala. 694.

freezing plant, equipment and costs, Oreg. 865.

home records, analysis, Ill. 608.

income—

and expenses, relation to price index, Nev. 287.

cash, in 1941, Miss. 284.

changes in and causes, Ill. 583.

distribution by income groups, S.C. 287.

higher, relation to high prices, Miss. 730.

labor, *see* Agricultural labor.

laborers of Louisiana and total war, La. 738.

land and building valuation, improved methods, Iowa 283.

leases, forms, Ariz. 438, 866.

machinery, *see* Agricultural machinery.

management—

aspects of war, Mich. 435.

data, Ky. 866.

on Maine farms with dairy enterprises, Me. 436.

study in Livingston County, [N.Y.] Cornell 129.

mechanization, economic possibilities, 123.

medium sized, decrease of, 586.

mortgage(s)—

analysis in selected counties, Iowa 283.

credit facilities in United States, U.S.D.A. 438.

debts and land market, 582.

in Kent Co., Del. 283.

of Pennsylvania, power used on, U.S.D.A. 297.

organization—

and management, low-income, Iowa 283.

for family-sized farms, U.S.D.A. 436.

planning in Box Butte Co., Nebraska, U.S.D.A. 285.

outlook for 1942 favorable, Utah 323.

parity prices and the war, Miss. 876.

policies, weak and strong features of, U.S.D.A. 285.

population movement, Iowa 283.

population of North Dakota, papers on, N.Dak. 877.

power, different types, cost per crop acre, Ill. 583.

price(s)—

and rural programs, attitudes of Edgefield Co. farmers toward, S.C. 801.

Farm—Continued.

- price(s)—continued.
 - in Indiana, historical analysis, Ind. 730.
 - studies, N.Dak. 135, 284, 730.
 - trends of Iowa, Iowa 283.
- privilege studies, Nev. 286.
- produce, freezing and storing, equipment and methods for, Ind. 754.
- production equipment, efficient use of, Mich. 578.
- production to meet needs of farm family, Wash. 158.
- products, *see* Agricultural products.
- programs, financing, U.S.D.A. 285.
- property assessments, characteristics, Md. 585.
- records, analysis, Iowa 283.
- records, use in farm management, Iowa 283.
- rehabilitation, Ind. 729.
- rental agreements in North Carolina, U.S.D.A. 288.
- rental arrangements, Ga. 808.
- residues, industrial use, profit aspect, 865.
- Security Administration and its attack on rural poverty, 730.
- service guide of Iowa, Iowa 302.
- shop practice, 445, 446.
- size as guide to planning in Tri-County Soil Conservation District, U.S.D.A. 286.
- size in central Indiana, Ind. 729.
- small cotton-corn, "food for freedom" on, Okla. 435.
- small, labor, power, and machinery on, Ohio 868.
- small Puerto Rico Reconstruction Administration, income on, P.R.U. 284.
- small, use of crop- and pasture land on, P.R.U. 284.
- storage, frozen, Idaho 725.
- structures, paint types for, N.J. 428.
- tenancy, *see also* Land tenure.
 - areas in Texas, type, U.S.D.A. 287.
 - in Box Butte County, Nebr. 133.
 - in Clay County, Nebr. 134.
 - in Kentucky, legal aspects, Ky. 133.
 - in New York, [N.Y.] Cornell 129.
 - in United States, bibliography, U.S.D.A. 585.
 - studies, Iowa 284.
- tenant problem, role of agricultural engineer in solving, 133.
- tenure—
 - and leasing practices, Iowa 283.
 - during changing price levels, Ind. 730.
 - Indiana, by type-of-farming areas, Ind. 730.
 - program, more adequate approach to, 582.
 - value of contour strips for, N.J. 342.

Farmer(s)—

- American, problems ahead, U.S.D.A. 285.
- and consumer, price spreads between, U.S.D.A. 294.
- attitudes to farm programs, 739.
- credit needs and opportunities, Ill. 583.
- local, adjusting production of food to local market demand, Ala. 754.
- Wisconsin, occupational mobility among, 736.

Farmers'—

- Bulletins superseded and those publications superseding them, U.S.D.A. 899.
- cooperatives during and after World War I, Okla. 130.
- Farmhouse design, construction, and equipment, new approaches to, 128.
- Farming—*see also* Agriculture.
 - adjustment programs, W.Va. 731.
 - adjustments, relation to slope and erosion, Ind. 730.
 - areas, four types, methods of share renting, Ind. 287.
 - enterprises of German Swiss in Tennessee, significance of cultural considerations in, U.S.D.A. 301.
 - grain v. livestock, Ind. 659.
 - high-speed, engineering implications, 277.
 - in Minnesota, effect of tractor on, U.S.D.A. 297.
 - large scale business management in, Okla. 730.
 - practices, approved, acceptance by farmers of Dutch descent, Mich. 879.
 - regional changes and future trends, 582.
 - systems for Central Bluegrass region, Ky. 130.
 - type in Nevada, Nev. 287.

Fasciola hepatica—

- notes, Utah 272.
- pathology in cattle produced by, Oreg. 854.

Fat(s)—*see also* Oil(s).

- determinations, errors in due to lipolysis, [N.Y.] Cornell 4.
- hydrolysis, use of basic dyes for demonstration, 35.
- liquid vegetable, glycerides of, fractionation, Ind. 616.
- microbial action on, *p*-aminodimethylani-line monohydrochloride as indicator, 630.
- problem, urgency of, P.R.U. 761.
- production in Holsteins, sire indexes for, relation to inbreeding, N.J. 360.
- synthesis from protein, 140.

Fatty acids—

- olefinic, 485.
- rate of absorption by rat, 309.
- unsaturated, effect on rat dermatitis, Mo. 147.
- unsaturated, fractional distillation, 107.
- Feather mites, effect on egg production, Mo. 85.

Fecal-flora studies, comparison of media for, Mass. 760.

Feces—

- human, vitamin C in, 153.
- nematode eggs in, counting, new apparatus for, 392.

Federal—

- Crop Insurance Act, amended, U.S.D.A. 437.
- Fruit Insect Laboratory, work of, Ind. 694.

Feed control officials and feed manufacturing industry, cooperation between, 100.

Feeding stuffs—

- analyses, Tex. 405, Vt. 834.
- Blumeria nieschulzi* growth-promoting potency, nature of, 270.
- evaluation on basis of digestible and metabolizable nutrients, 555.
- examination, new features in, 100.
- Idaho, cobalt content, Idaho 616.
- in brood sow rations, supplementary value, Mo. 101.
- inspection and analysis, Ky. 100.
- native, of Alaska, utilization, 162.
- pantothenic acid in, 257.
- price information as aid in feed-buying programs, Mo. 443.
- price level and prices, [N.Y.]Cornell 130.
- stored, deterioration in, 100, 412.

Heltia subgithica oviposition habits, 822.

Fence(s)—

- electric, insulating supports for, types, [N.Y.]Cornell 120.
- farm, construction, Iowa 277.
- posts, galvanized and painted steel, comparative costs and condition after 16 years' service, S.Dak. 573.
- posts, preservative treatments, 577.

Fencing—

- atmospheric exposure tests, Iowa 277.
- cooperative tests, [N.Y.]Cornell 120.
- materials treated with copper sulfate and zinc chloride, corrosion, S.C. 428.

Fern(s)—

- and flowering plants of Arizona, U.S.D.A. 347.
- cloak, poisoning in sheep, goats, and cattle, Tex. 565.
- growth and metabolism, effect of X-rays, [N.Y.]Cornell 33.

Ferrets, distemper studies in, 571.

Fertility studies, pot and field, P.R.U. 183.

Fertilizer(s)—

- acidulated, Ariz. 768.
- and cropping history, effect on present fertility needs, Miss. 660.
- and lime spreader, Tenn. 428.
- application, more effective method, N.Y.State 775.
- applied to soil, fate of, Miss. 344.
- balanced, need of Volusia soil for, Pa. 482.
- consumption trends, U.S.D.A. 292.

Fertilizer(s)—Continued.

- determination of K_2O in, using 95-percent and 80-percent alcohol and acid alcohol, 477.
- effective use, N.J. 347.
- experiments, Mo. 22.
- experiments, results of, N.Dak. 188.
- handbook, farmer's, Wash. 346.
- in solution, use on vegetables, N.J. 669.
- inspection and analyses, Ky. 775, N.H. 347, R.I. 643.
- inspection, registration, and labeling, Mo. 775.
- legal requirements and analytical data, Conn.[New Haven] 30.
- materials, prospective shortage and possible substitutes, N.Y.State 222.
- mineral, chemistry of, and Liebig, 616.
- mixtures containing phosphate rock supplements, available phosphoric acid in, determination, 334.
- nature and purchase of, Mo. 347.
- nitrogenous, *see* Nitrogenous fertilizer.
- other than nitrogen for cotton, Miss. 774.
- plastic wastes as, value, N.J. 342.
- recommendations, suitable rapid soil-testing method for use in making, Fla. 768.
- report for 1941, Mont. 484.
- residual effects, Wis. 483.
- sampling, 334.
- use in New Jersey, N.J. 342.
- use on representative upland soils, Wash. 343.

Fescue silvertop control, U.S.D.A. 680.

Fiber identification, methods and practice, 463.

Field experiments, critical, presentation of results, 428.

Fields, terraced, improved row system for, 343.

Filbert—

- blight control, 242.
- worm, biology, U.S.D.A. 88.
- worm problem, 401.

Filter pressure, laboratory-size leaf-type, 169.

Finance, public, situation in rural school districts in oil-producing areas, Okla. 730.

Financial situation of the family in wartime, 754.

Fir—

- and spruce forests, selective cutting for, Mich. 226.

balsam, cleaning in cut-over hardwood stands, 65.

Douglas—

- effect of girdling, 804.
- parthenocarp, parthenogenesis, and self-sterility, 804.
- seed production in, effect of climate, 341.

Johnson, description, 677.

Fire(s)—

- forest, *see* Forest fire.
- in hay mow, use of CO_2 in control, 282.

Fire(s)—Continued.

- insurance companies, farmers' mutual, re-insurance among, U.S.D.A. 439.
- insurance, farmers' mutual in Maryland, Md. 134.
- prevention and protection, activities in, 129.
- prevention, rural, 582.
- risks, farm, classification and rating, U.S.D.A. 439.

Fireworm—

- black-headed, control, Mass. 820.
- false yellowhead, 401.
- hill, notes, Mass. 820.
- rotenone sprays for control, Wash. 394.

Fish(es)—

- fresh-water, arsenic in, 740.
- from Bengal market, nutritive value, 589.
- game and forage, economic importance and life history, [N.Y.]Cornell 86.
- meal in poultry rations, Wash. 404.
- meal v. crab meal for poultry rations, Mass. 837.
- nicotinic acid in, 150.
- of Iowa, survey, Iowa 245.
- oil factors responsible for depressing fat in milk, Mo. 103.
- oils and meals, vitamin and protein values, Wash. 404.
- oils, characteristics, properties, and vitamin content, 138.
- ponds, farm, management, Ala. 694.
- products, riboflavin in, 151.

Fishery products as human and animal food, nutritive value, Mass. 760.**Fishing rods, split-bamboo, construction, industrial possibility for Puerto Rico, P.R. 725.*****Fistulina hepatica* on sprout oak stands, U.S.D.A. 83.****Fixatives, rate of penetration, 629.****Flannel(s)—**

- from new and reprocessed wool, properties, 320.
- outing, physical analysis, 320.

Flax—

- diseases in southeastern Kansas, U.S.D.A. 680.
- diseases, seed-borne, prevention, 74.
- fiber, in western Washington, Wash. 369.
- prices received by farmers, S.Dak. 876.
- production, determining suitable areas, 21.
- rust, effect of borax, 235.
- seed, date-of-seeding test, Ariz. 791.
- seed, fertilizer tests, Ariz. 791.
- seeding rate and crop sequence studies, Iowa 213.
- varieties, merits and limitations, N.Dak. 217.
- variety tests, Iowa 212, Wash. 367.
- zinc deficiency in, symptoms, 810.

Flaxseed—

- examination, Ulster method, 533.
- mechanical injury, 684.

Flaxseed—Continued.

- production in North Central States, U.S.D.A. 369.
- production problems in Southwest, 280.

Fleas—

- control, Mo. 393.
- of economic importance, distribution and hosts, 96.

Flood—

- control and water conservation project, 278.
- control engineering and drainage, 575.
- control studies, 632.
- forecasting in Pennsylvania, 632.
- of 1938 at Big Eau Claire Dam in Wisconsin, 632.

Flora—see also Plant(s) and Vegetation.

- of Arizona and New Mexico, 194.
- of Cuzco, synopsis, systematic part, 777.
- Floriculture, fundamentals and practices, textbook, 523.

Florida Station notes, 610.**Florida Station report, 899.****Flour—see also Bread,**

- and growth of *Tribolium*, 399.
- and wheat technology, 16.
- baking strength, recording micro dough mixer for determining, N.Dak. 627.

beetle, confused—

- growth and pupation, growth factors required for, 399.

population, theory of growth, 399.**changes in during storage, Utah 626.**

- crystalline protein hydrochloride from, bactericidal and fungicidal properties, 33.

diluted with wheat starch, character of recording-dough-mixer curves, 328.**enriched, or nutritionally improved, 450.****high vitamin, 450.****Illinois wheat, cake-baking characteristics, Ill. 589.****milling and vitamin B₁ deficiency, 603.****moth, Mediterranean—**

- methods of breeding *Chelonus an-nulipes* on, U.S.D.A. 254.

notes, 551.**nicotinic acid in, determination, 622.****wheat and related products, definitions and standards of identity, 314.****whole-wheat and white, protein of, 139.****Flow regulator, laboratory-scale, 170.****Flower(s)—see also Plant(s), flowering, and****Plant(s), ornamental.****annual, tests, Pa. 803.****gardens, home, Mo. 376.****greenhouse, nutrient solution cultures for, Ill. 523.****growing, N.Mex. 371.****seeds, packet, testing, Mass. 800.****soilless culture, Mass. 800.****thrips, Florida, Fla. 822.****Fluids, biological, riboflavin in, fluorometric determination, 621.****Fluorescein, effect on plant growth, 780.**

Fluorine—

- absorption by foods cooked in water containing fluorine, Ariz. 880.
- antidotes, 87.
- assimilation by rats from natural and synthetic cryolite, 143.
- assimilation from different sources, 454.
- compounds, volatile, for insect control, 822.
- dietary, determination, 178.
- in human saliva, 890.
- in water supplies, 164.
- in rock phosphate as mineral supplement to fattening lambs, effect, 557.
- poisoning in rats and calcium intake, 86.
- reduction in experimental rat caries by, 598.
- removal from superphosphates, 345.
- retention and elimination in bones, 747.
- studies, Ariz. 760.

Fluorophotometers of varying design and construction, evaluation, 620.**Fly (ies)—**

- house, see Housefly(ies)
- sprays, studies, U.S.D.A. 89.
- western genera, 402.

Flycatchers, North American, life history, 545.**Fomes—**

- annosus* root rot on western hemlock, 543
- applanatus* white mottled rot on western hemlock, 543.
- fomentarius* on hardwoods, biology, Me 693.
- hartigii* white trunk rot on western hemlock, 543.
- ignarius* on aspen, relation of tube layers to age in sporophores, 83.
- officinalis* brown trunk rot on western hemlock, 543.
- pinicola* brown crumbly rot on western hemlock, 543.
- subroseus* yellow-brown top rot on western hemlock, 543.

Food(s)—see also Diet(s).

- and biological material, manganese in, bibliography, 453.
- and biological materials, vitamin B₁ determination in, improved procedure for, 762.
- and Drug Administration, definitions and standards of identity, 314.
- canned, labeling, 451.
- common, nutritional values, Colo. 740.
- common, relative economy of nutrients in servings of, [N.Y.]Cornell 137.
- consumption, family, and dietary levels, U.S.D.A. 136.
- consumption in German worker families, U.S.D.A. 284, 307.
- consumption of South Carolina farm families, S.C. 451.
- for defense, 583.
- for freedom on small cotton-corn farms, Okla. 435.
- for freedom production, financing, U.S.D.A. 435.

Food(s)—Continued.

- fortification and nutritional restoration, 449.
- frozen—
 - and stored in refrigerated locker plants, Iowa 303.
 - desiccation in freezer locker stores, 16.
 - locker plants, development in South Dakota, S.Dak. 873.
 - stretching sugar ration for, 886
- habits of consumer groups affecting farmers' markets, Ala. 75+.
- industries, developments in science likely to affect, 16.
- ingested, relation to softness of body fat.
- adaptability of rat for studies of, Iowa 303.
- mixers, small electrical, operating efficiency, Iowa 322.
- of Great Britain, 446.
- of India, proximate constituents and Ca and P in, 589.
- of Navajo Indians, preparation and preservation, 137.
- of Puerto Rico, retail price increases, P.R.U. 876.
- perishable, paper for packing, public health compliance by manufacture of, 818.
- poisoning organisms, effect of carbon dioxide on, Mich. 258.
- preparation and phytic acid, 594.
- preservation—
 - in frozen food lockers, Kans. 305.
 - in wartime, problems, N.Y State 305 prospectus, 451.
- preserving agents, toxicity of, 306.
- prices, retail, rise in Puerto Rico, P.R.U. 293.
- production in Puerto Rico, relation to amount consumed, P.R.U. 465.
- products, mold inhibitors for, 741.
- products, riboflavin and thiamin in, combined determination, 10.
- rations in Germany, U.S.D.A. 435.
- selecting, to meet body needs, Ohio 306.
- situation in far eastern and southeastern Asia, U.S.D.A. 285.
- supplies, home production, Tenn. 464.
- values in shares and weights, 740.
- values, tables, fourth edition, 446.
- victory, preservation, farm home goal, Miss. 741.
- vitamin A activity of, Fla. 880.
- vitamin content, selection and use of values expressing, 312.
- vitamin values, relation to processing and other variants, U.S.D.A. 891.
- with alkaline balance, ash determinations in, 335.

Forage—**crop(s)—**

- composition, effects of soil type and fertilizer treatments, 639.
- for irrigated areas, Colo. 507.

Forage—Continued.**crop(s)—continued.**

- insects, studies, [N.Y.]Cornell 90.
- mixtures, variety tests, Wash. 367.
- on San Joaquin Experimental Range, management, Calif. 661.
- variety tests, N.Mex. 366.
- grasses, *see* Grass(es).
- intake by grazing steers, fecal dry matter as index, 258.
- nursery and plant adaptation studies, Fla. 792.
- plants, abnormally poisonous properties, relation to soil nitrogen, Wyo. 851.
- plants, mountain, growth and carbohydrates in, effect of clipping and grazing, U.S.D.A. 505.
- plants of Arizona, composition and carotene content, Ariz. 760.
- poisoning, *see* Plants, poisonous, and specific plants.

Forest(s)—

- and people, U.S.D.A. 65.
- cover types, symbols for, U.S.D.A. 226.
- fire prevention, fire-fighting plans and equipment, U.S.D.A. 227.
- growth in Adirondack region, relation to soil, [N.Y.]Cornell 23.
- insect hazard inventory in California, completion, U.S.D.A. 88.
- insect larvae, new descriptions, 400.
- insect survey, 395.
- nursery stock, nutritional requirements, Conn.[New Haven] 803.
- of Illinoisian till plain, successions of forest cover, 524.
- plantation in Nebraska sandhills, climatic conditions, 182.
- plantations, establishment, culture, and development, [N.Y.]Cornell 65.
- planting stock production, improved practice in, [N.Y.]Cornell 65.
- second-growth, in western Sierra Nevada, income from, Calif. 65.
- seedlings, growth in nutrient solutions, Wis. 524.
- sites, types and classification, 65.
- southern farm, Miss. 159.
- species, growing, Fla. 799.
- spruce-fir, selective cutting for, Mich. 226.
- trees, *see* Trees.

Forficula auricularia, *see* Earwig, European.

Formaldehyde determination in presence of other aldehydes, 5.

Foulbrood—

- American, resistance studies, 553, U.S.D.A. 88.
 - American, variation in resistance to, Iowa 247.
 - resistant strain of bees, N.J. 391.
- Fowl(s)—*see also* Chick(s), Chicken(s), Hens, Poultry, etc.**
- Black Sumatra, multiple spurs and duplex comb, 211.
 - creeper, studies, 789.

Fowl(s)—Continued.

- fecundity in, genetic selection for, [N.Y.]Cornell 47.
- fibrosarcoma of pectoral muscles, 721.
- genetics, nomenclature, 368.
- genetics of, 49, 211.
- hormonally treated, sexual behavior, 500.
- intersexual, sexual behavior, 500.
- new type of autosomal nakedness in, 658.
- paralysis, *see* Paralysis.
- semen production, effect of epinephrine, 501.
- seminiferous tubules, diurnal rhythm of mitotic activity in, 385.
- sex-linked early maturity in, [N.Y.]Cornell 47.
- sperm, preservation by cooling and freezing, Ind. 656.
- talpid lethal in, 498.
- tick, biology, 554.

Fox(es)—

- Chastek paralysis in, 571.
- Chastek paralysis in, and thiamin deficiency, 858.
- digestion of cereal starch and fiber, 407.
- northern plains red, ecology and management, Iowa 245.
- nutritive requirements for growth, fur production, and reproduction, [N.Y.]Cornell 85.
- parasites and diseases, Iowa 245.
- silver, *Salmonella* types in, 118.

Foxtail, green, seed germination, 512.

Frankliniella—

- fuca*, *see* Tobacco thrips.
- raccini*, notes, 828, Me. 248.

Freezias, cultural requirements, Mass. 800.

Freezer plant, farm, equipment and costs, Oreg. 865.

French Equatorial Africa, article on, U.S.D.A. 284.

Frog, edible, biology, 394.

Frost—

- protection, blowers for, 281.
- spring, escape dates for Kansas, 792.

Fruit(s)—*see also* Orchard(s), Apple(s),

Peach(es), etc.

- adaptability for freezing preservation, Tenn. 372.
- and air temperatures, relation, 841.
- and vegetable auction markets, farmers' country, operation, [N.Y.]Cornell 129.
- biennial varieties, effect of types of pruning, [N.Y.]Cornell 61.
- breeding, S.Dak. 513.
- Breeding Farm, Minnesota, report, 670.
- bud killing by low temperature, Mich. 767.
- canned, firmness, Ky. 884.
- canning, Wash. 451.
- citrus, *see* Citrus fruits.
- cooperative canning, U.S.D.A. 295.
- cooperatives in Michigan, Mich. 874.
- crop losses, relation to cold spots in orchards, Pa. 513.

Fruit(s)—Continued.

crops, difference in yield and behavior, soil factors associated with, [N.Y.] Cornell, 60.

cryolite-sprayed, assimilation of fluorine by rats from, 143.

cultural requirements, Iowa 373.

deciduous, statistics, Calif. 876.

developing, rates of division in large and small cells, 205.

diseases—
and weather in 1941, 631.
in Ozark section of Arkansas, U.S. D.A. 66.
in New York State, 540, U.S.D.A. 680.
in Pennsylvania, U.S.D.A. 680, 805.
reports, U.S.D.A. 680.
studies, S.Dak. 528.

dried and dehydrated, nutritive value, N.Y.State 450.

dried, production, 17.

drop chemicals, compatibility, 672.

drop control with hormones, Colo. 801.

drying for home use, Utah 741.

economy of production in home garden, Iowa 321.

effect of sprays and heavy soil application of borax, 671.

farming in Yakima Valley, Wash. 436.

Florida, pliofilm wrappers for, Fla. 372.

freezing, Ind. 668.

freezing preservation, Iowa 220.

frozen, industry in Tennessee, economic aspects, Tenn. 290.

frozen-packed, organoleptic tests for reliability, 140.

frozen, research on, 885.

frozen, tissue of, microscopic studies, 885.

garden, home, U.S.D.A. 516, 670.

industry of Argentina, U.S.D.A. 735.

industry of Brazil, U.S.D.A. 735.

industry of Chile, U.S.D.A. 736.

insects control, 547, 824, Fla. 822.

internal atmosphere, simultaneous measurement of CO_2 and volatiles in, Mo. 57.

jellies and jams, Mass. 760.

juices, fresh and canned, vitamin C in, comparative costs, 457.

juices, packaged, change in oxidation-reduction potential in, Mass. 760.

kind and variety for freezing, S.Dak. 590.

locker freezing, Wash. 139.

marketing, [N.Y.]Cornell 129.

marketing, bibliography, U.S.D.A. 440.

marketing problems, Utah 733.

maturity, factors affecting, Wash. 372.

minor, tests, Fla. 799.

moth, oriental—
bionomics and control, Del. 245.
introduction of parasites in peach orchards, Mass. 820.
nicotine oleate for control, Ill. 546.
parasites, U.S.D.A. 88, Va. 824.

Fruit(s)—Continued.

moth, oriental—continued.
studies, Conn.[New Haven] 822, Mo. 85, S.C. 393.

native, utilization in fermentation industries, P.R.U. 165.

new, breeding, N.Y.State 801.

nutritive index, 137.

of Costa Rica, vitamin C in, 458.

of Florida, vitamin C in, Fla. 880.

of India, proximate constituents and Ca and P in, 589.

phenology of, N.Mex. 371.

plants, daily rate of photosynthetic activity in, [N.Y.]Cornell 61.

plants, insect and disease control, Miss. 824.

preparing for refrigerated locker storage, Okla. 741.

preservation by freezing in refrigerated locker plants, Iowa 885.

preservation, methods available for, Miss. 741.

preserving, saving sugar for, Colo. 884.

prices, changes in, [N.Y.]Cornell 134.

production and composition, relation to leaf area, Wash. 372.

production in California, relation to climate, 519.

production in home gardens, value of spraying, pruning, and fertilizing, Utah 223.

products, potassium determination in, 337.

products utilization, Wash. 327.

quality production, effect of spray schedule, Miss. 221.

refrigerated gas storage, 673.

refrigerated locker storage of, Iowa 303.

relation to human nutrition in wartime, 884.

retailers' gross margins on, P.R.U. 284.

set in Washington orchards, factors affecting, Wash. 372.

set, reduction by blossom-time sprays, 540.

small, frozen-pack, vitamin C in, Wash. 447.

small, resistance to diseases, Wash. 372.

small, variety tests, Ill. 516.

stone, blossom blight, arsenite sprays for, 540.

stone, brown rot control, 816.

stone, virus diseases of, handbook, Mich. 691.

stone, virus diseases, transmission technique for study, 81.

storage and preservation with pliofilm, ultraviolet light, and brine, Fla. 760.

storage responses, Wash. 372.

sulfuring, burning of sulfurs used in, Calif. 339.

tests, Ariz. 799.

thinning, effects, Miss. 671.

tissue, frozen-stored, inactivation of browning system in, 645.

Fruit(s)—Continued.**tree(s)—**

- black cancer, control with naphtha byproducts, 229.
- budded, crown gall on, 386.
- effect of blizzard of 1940 in Iowa, 767.
- in irrigated regions, control of orchard mites on, Wash. 394.
- insects studies, 394.
- leaf roller in Kickapoo apple area, Wis. 546.
- low-producing, effect of manure on yield, [N.Y.]Cornell 61.
- mature, framework grafting, 670.
- nutritional conditions, relation to biennial bearing, growth, and yield, [N.Y.]Cornell 61.
- pome and stone, damage in Missouri from severe freeze, 707.
- rough-bark diseases, transmissible, 387.
- stocks in Iowa nurseries, diseases, Iowa 228.
- trials and other introductory plantings, Fla. 799.
- winter injury, factors affecting, Wash. 372.

- tropical, studies, 63.
- varieties for Ohio, recommended and new, descriptions, Ohio 516.
- varieties, selecting, Mo. 60.
- varieties, tree characters, Mass. 800.
- variety tests, Ky. 800, Mass. 800, Wash. 372, Wyo. 801.

Fruitlet(s)—

- in Argentina, 402.
- Mediterranean, U.S.D.A. 88.
- Mexican, U.S.D.A. 88.
- West Indian, adult populations in citrus plantings in Puerto Rico, P.R. 96.

Fruitworm(s)—

- control, Ky. 822.
- effect of cryolite on, Miss. 256.
- in blueberries, control, N.J. 391.
- oriental, studies, Ind. 694.
- rotenone sprays for control, Wash. 394.

Fuel wood used in United States, U.S.D.A. 227.***Fumago sacchari*, notes, 535.****Fumigants—**

- greenhouse, Mass. 820.
- new methods of applying, U.S.D.A. 5.

Fungi(us)—

- and bacteria, antibiosis between, studies, 486.
- collected from crop plants and diseases caused by them in Georgian S. S. R., 529.
- conjugate nuclear division in, 494.
- cultures, mounting for preservation in herbarium, 529.
- entomogenous, 67.
- filamentous, vitamin deficiencies, 644.
- genetics, papers on, 208.

Fungi(us)—Continued.

- growth in culture, actinomycetes inhibiting, 486.
- hyphae, composition, 349.
- micro culture slide for, 331.
- migration of nuclei in an electric field, 493.
- of Mount Shasta, host index additions, U.S.D.A. 680.
- of Nevada, U.S.D.A. 527.
- parasitic, of Wisconsin, 807.
- parasitic on cereals, U.S.D.A. 680.
- parasitic, on cereals and grasses, revised check list, U.S.D.A. 70.
- predaceous, 68.
- seed-borne, on cereals in Canada, 532.
- spore germination in presence of copper and sulfur, effect of temperature, 380.
- spores, air-borne, 193.
- spores, primary dispersal and isolation of, 776.
- taxonomy, importance of variation in, 35.
- wood-destroying, U.S.D.A. 680.

Fungicidal action, mechanism, 380.**Fungicidal substances, new, 381.****Fungicide(s)—see also Spray(s) and specific kinds.**

- airplanes for application on cranberry bogs, N.J. 391.
- and insecticides, analyses, Mo. 221.
- copper, see Copper.
- evaluation, dosage-response curve in, role of, Conn.[New Haven] 230.
- ingredients commonly used in, specifications, Ohio 178.
- new, 531.
- nonlinear dosage-response curves, hypothesis account for, 67.
- shortage, suggestions for meeting, Conn. [New Haven] 805.
- studies, 531, Miss. 382.
- use in wartime, 810.

Fur—

- animals of North America, bibliography, 391.
- fibers, types, 558.
- wild, production and use on agricultural land, U.S.D.A. 86.

Furniture carpet beetle. Biology, [N.Y.]Cornell, 94.***Fusarium—***

- batatas vanillae* root rot, limiting factor in vanilla production, P.R. 679.
- bulbigenum lycopersici* on Pan America tomato, 239.
- culmorum*, colonization on buried wheat straw, 382.
- from subterranean clover seed, 683.
- moniliforme*, mode of entrance into corn ears, 383.
- oxysporum cubense* in soil, effect of chemicals, 70.
- solani martii* on American holly, N.J. 378.
- species concept in, 70.

Fusarium—Continued.

- sp., lysis in, destructive changes of protoplasm, 87.
 spp. associated with wheat root rot, pathogenicity, 687.
 spp. from cotton, tobacco, and other plants subject to wilt, cross inoculations, 807.
 taxonomic characters, effect of light, 194.
 wilt of China aster, Ind. 679.
 wilt of cotton, 234.
 wilt of potatoes, extensive occurrence, Idaho 679.
 wilt of watermelon, studies and control, Fla. 808.
 wilt organisms, cross-inoculations, S.C. 378.
Fusiformis nodosus n.sp. cause of sheep foot rot, 278.
Galerucella xanthomelaena, see Elm leaf beetle.
 Gall midge injury to red pine, 245.
Galleria mellonella, see Wax moth.
 Gallium, boundary tension, 165.
 Game, production and use on agricultural land, U.S.D.A. 86.
Ganoderma oregonense white spongy rot on western hemlock, 543.
 Garbage types, composition, digestibility, and nutritive value, 406.
 Gardenia—
 bud abscission in, Wash. 372.
 chlorosis, effect of vitamin B, at different soil temperatures, Mass. 807.
 nutrient and soil reaction needs, Ill. 523.
 Phomopsis stem canker, Mass. 807.
 Gardens—
 for food, health, and victory, Miss. 58.
 home vegetable, N.J. 669.
 irrigation experiments, Wyo. 801.
 spray machinery for, Miss. 863.
 Victory, Iowa 221, U.S.D.A. 58, Utah 221.
 Victory, insecticides for, S.Dak. 695.
 Garlic culture in North, Ohio 515.
 Gases, acid, in smoke, localized injury to plant organs from, 230.
 Gastric—
 juice secretion in deficient hydrochloric acid production, effect of vitamin A, 145.
 ulcers in rat, dietary factors related to, Iowa 308.
 Gastroenteritis, verminous, in calves, 272.
 Geese—
 feeding, wartime, 837.
 wild, food plants, value, propagation, and management, 86.
 young, feeding of cut grass to, 841.
 Genes and chromosomes, structure and organization, 495.
 Genetical Congress, International, proceedings, 43.
 Genetics—
 and evolution in light of religion, 206.
 and the origin of species, 43.
 in U.S.S.R., 206.
 new paths in, 786.

- Geocoris atricolor* feeding on pea aphids, 398.
 Geophytes, epiphytes, and parasites, production of alkaloids and cyanogenetic and organic sulfur compounds, 68.
 Geranium cutting(s)—
 root structure, effect of root media, Mass. 775.
 rot, 388.
Gibberella—
 fujikuroi, internal grain infection of corn by, 74.
 zeae, mode of entrance into corn ears, 383.
Gigantobitharzia gyrauli, life cycle, 86.
 Gingivitis treatment with ascorbic acid, 154.
 Girls, freshman, of Maine University, nutritional status, Me. 302.
 Gizzard—
 erosion in growing chickens, 840.
 lesions in day-old chicks, 561.
 Gladiolus—
 blight or rust, Fla. 709.
 chromosome number and hybridization in, 46.
 cormlet, origin and development, 786.
 culture, new diseases threatening, 82.
 Fusarium yellows control, 818.
 Fusarium yellows, varietal resistance, 692.
 thrips control, Ind. 694.
 thrips on corms, single treatment for destruction, 548.
 thrips, studies, Fla. 822, U.S.D.A. 88.
 Glass(es)—
 beverage, sanitization of, 888.
 container research, Mass. 761.
 drinking, of restaurants, bactericidal effect of ultraviolet rays on microorganisms, 305.
 Globulin(s)—
 of cucurbit seeds, 744.
 of watermelon seed, protein nutritional studies, Conn.[New Haven] 760.
Glomerella oingulata, inheritance of plus and minus characters, 80.
 Glucose—
 dissimilation by *Ochaetomium funicola*, 491.
 fermentation, new type, by *Clostridium thermoaceticum* n.sp., 776.
 ingestion, effect on blood pyruvic acid, 603.
 Glycerol determination, 176.
 Glycerol-water mixtures, entomological work with, maintenance of high atmospheric humidities for, 821.
 Glycine requirement of chicks, 838.
 Glycogen—
 formation in liver and muscle from glucose and fructose after extreme muscular exhaustion, 808.
 in oysters, determination, 336.
 of tissue, depletion during fasting and fatigue, and partial recovery without food, 808.
Glypta reftscutellaris, notes, Va. 824.

Gnat, Clear Lake, studies, U.S.D.A. 89.

Gnortimoschema gudmannella, studies, P.R.U. 248.

Goat(s)—

abnormal sex anatomy, 51.

and cow milk secretion, effect of fasting and refeeding, Mo. 103.

buck, quality of semen produced when does are not in heat, N.J. 360.

dairy, breeding, N.Mex. 411.

dairy, management, N.J. 706.

fed hagarl fodder and cottonseed meal, relative carotene and vitamin A in blood, liver, and butterfat, N.Mex. 411.

milk, bacterial content, 847.

milk, blood, and tissues, ascorbic acid in, N.C. 706.

new feeding standards for, Ill. 562.

nicotinic acid and manganese requirements, [N.Y.]Cornell 99.

poisoning from cloak fern, Tex. 565.

production, lawn clipping silage for, N.J., 408.

worm-free, effect of phenothiazine on weight, 423.

Gold absorption and excretion by man, 748.

Gonadotropic—

antisera, fowl and mammalian, specificity, 790.

antiserum, effect on postnatal development of male rat, 655.

hormone activity, effect of ascorbic acid, 362.

hormone, chorionic, preparation, new method, 780.

hormone from pregnant mare serum concentrating, Mo. 47.

Gonadotropin—

chorionic, response of gonads of testosterone-treated animals to, 51.

chorionic, response of uterine weight to, 655.

in pregnant mare serum and horse pituitary gland, comparison, 50.

Gooseberry—

breeding, Ill. 516.

insects, life history and control, Wash. 92.

varieties, N.Mex. 371.

Gossyparia spuria, see Elm scale, European.

Gossypium—

asynaptic plants and polyploids, 206.

chromosomes, 44.

species hybrids, haploids, and induced polyploids, meiotic chromosome behavior in, 208.

Gossypol in crude cottonseed oil, determination, 176.

Governmental costs and taxes in rural New York, [N.Y.]Cornell 130.

Gracilaria negundella, notes, 247.

Grain(s)—see also Cereal(s) and Oat(s), Rye, Wheat, etc.

and hay in mixed ration, digestibility, 257.

Grain(s)—Continued.

beetle, saw-toothed, in stored raisins, U.S.D.A. 88.

bins, ventilated, performance of cows for, 864.

conversion of weights of mechanical separations into percentages, U.S.D.A. 214.

crops, composition, effects of soil type and fertilizer treatments, 639.

crops for pigs, substitution of hay and pasture crops, Iowa 283.

dehydration, development of portable driers for, Ind. 725.

diseases, in California, U.S.D.A. 527.

diseases in Oklahoma, U.S.D.A. 527.

diseases, reports, U.S.D.A. 680.

drier, portable, 163.

feeding methods to layers, Fla. 833.

fermenting, with yeast for swine, Ill. 554.

fineness of grinding, effect on utilization by dairy cattle, S.Dak. 563.

germination, effect of storage in contact with seed-pickling dusts, 811.

insects, N.Dak. 248.

merchandising practices, Iowa 284.

moisture content increased by snow, N.Dak. 126.

price-guaranteeing policy of Argentina, evolution, U.S.D.A. 435.

producing, costs and practices in, Ind. 729.

riboflavin content and distribution in products of wheat milling, 750.

seed, cleaning and treating, annual necessity, N.Y.State 323.

shipments from points on Illinois River, Ill. 584.

small, diseases in North Carolina, U.S.D.A. 60.

storage, engineering phases, 580.

stored, insects—

control, N.Dak. 248, U.S.D.A. 88.

emergency research, Iowa 247.

killing by drying, Ill. 573.

stored, pest control, Mo. 393.

stored, protection, insecticidal value of dusts for, 395.

weeds in, control by chemical sprays, Wis. 505.

Gram foot rot, cause, 232.

Gram types, resistance to blight disease, determination, 232.

Gramicidin—

and Penicillin, comparative bacteriostatic activity, 33.

studies, 852.

Gramineae, western, leaf spot fungi on, 72.

Granuloma, coccidioidal, in cattle, associated with actinomycetoidlike clubs, 713.

Grape(s)—

berry moth, insecticides for, U.S.D.A. 88.

berry moth, spraying for control, Mich. 824.

cane girdler, biology and control, Mass. 820.

Grape(s)—Continued.

- cluster thinning, Ill. 516.
- Concord, chlorosis of, effect of root on, 542.
- Concord, substitutes for, Okla. 674.
- Concord, uneven ripening, Okla. 673.
- culture, P.R.U. 221.
- effect of modification of storage atmosphere, Iowa 220.
- fruit rots, Fla. 806.
- juice fermentation, formic acid formation in, 181.
- leafhopper—
 - new sprays for control, Ill. 546.
 - notes, Ind. 694.
 - spraying for control, Mich. 824.
- maturity, relation to yield, composition, and quality of raisins, Calif. 339.
- mold control in by sulfur dioxide, 816.
- muscadine varieties, ascorbic acid in, 895.
- nutrition, Mo. 57.
- oxidase activity, effect of pretreatment and subsequent drying, Calif. 339.
- plume moth, biology and control, Mass. 820.
- production, effect of boron on, S.C. 371.
- seedlings, growth, S.C. 371.
- seeds, muscadine, germination, S.C. 371.
- sultana, fertilizer experiments, 521.
- varieties, N.Mex. 371.

Grapefruit—

- boron toxicity to, Ariz. 805.
- fertilization, P.R.U. 221.
- juice, peel oil determination in, 377.
- quality and yield, factors affecting, Ariz. 798.
- quality, in commercial groves of Salt River Valley, Arizona, 521.
- rinds, hard spots or gum pockets in, control, Fla. 806.
- trees, nitrogen uptake by, Ariz. 798.

Grapevines, pruning, N.J. 376.

Graphium, pyridoxine as growth factor for, 83.

Grapholita—

- molesta*, see Fruit moth, oriental.
- packardii*, see Cherry fruitworm.

Grass(es)—see also Grassland(s), Lawns, Meadows, Pasture(s), etc.

- alpine, carbohydrate metabolism in, relation to adaptation problems, 37.
- and alfalfa combinations, Ky. 792.
- and alfalfa mixture on irrigated land, value, Colo. 214.
- and legumes grown in associations, interrelations, Ind. 659.
- aphid host records, 548.
- best suited to aviation landing fields, N.J. 366.
- British, diseases, 810.
- caterpillar, subterranean, chemical control, 551.
- composition and adaptations, Ill. 504.
- creeping bent, brown patch and dollar spot of, thiram disulfide for, N.J. 810.
- culture tests, Idaho 659, S.Dak. 504.
- diseases, U.S.D.A. 805.

Grass(es)—Continued.

- downy mildew of, 236.
- establishment in permanent pasture without plowing, N.J. 366.
- farming for improving depleted soils, Ky. 507.
- farming, studies, Mo. 213.
- fertilizer tests, Idaho, 659.
- for partially shaded areas, N.J. 366.
- forage—
 - and pasture, improvement, Fla. 792.
 - breeding, Wash. 367.
 - diseases, Wash. 378.
 - improvement, greenhouse germination and propagation method, 214.
 - on mountains, growth and carbohydrates in, effect of clipping and grazing, U.S.D.A. 505.
 - production, P.R.U. 213.
 - variety tests, Fla. 791, Idaho 659, S.Dak. 504, Wyo. 793.
- germination and growth, effect of thiamin additions, N.J. 368.
- grass associations, and legumes for pastures, [N.Y.] Cornell 53.
- grazing value on cut-over, dry Norfolk sand areas, Fla. 792.
- hybrids, inheritance of disease resistance, Wash. 367.
- improved, introduction into established sod, N.J. 366.
- in mixtures, tests, Ky. 792.
- mixtures for feed, carotene in, 257.
- native, reestablishing in Kansas, 792.
- new, from Venezuela, 777.
- nurse crops for, Ky. 792.
- of Montana, seasonal changes in lignin and cellulose content, 99.
- of Wisconsin, *Muhlenbergia* and *Sporobolus*, 36.
- parasitic fungi on, U.S.D.A. 680.
- pasture, breeding, Tenn. 367.
- pasture, promising, palatability, Iowa 213.
- range—
 - behavior and composition after burning, Fla. 792.
 - composition, N.Mex. 327.
 - growth and development in, 353.
 - tests, Wyo. 793.
- seed germination, 512, Iowa 213.
- seed, Michels', unsatisfactory for fattening hogs, Idaho 697.
- seed production experiments, Idaho 659.
- seed samples used in soil conservation, weed impurities in, 32.
- seed, sterilization technic, 810.
- seedlings on burned-over land, Idaho 659.
- seedling—
 - development physiology, 784.
 - emergence studies, 31.
 - establishment and productivity, 487.
- short, methods of quadratting, comparison, 505.
- silage, see Silage.
- snow mold of, cause, Pa. 528.

Grass(es)—Continued.

sod-forming, fertilizers for, N.J. 306.
southern, germinating seeds of, 512.
stands, natural, effects of burning on
maintenance, Fla. 792.

Sudan and Bahia, growth, relation to
development and deterioration of
roots, Fla. 791.

turf, response to fertilizers, Pa. 504.
variety tests, Fla. 791, Ill. 504, Iowa
212, Pa. 504, Tenn. 367, Wash. 367.

Grasshopper(s)—

control by tillage, N.Dak. 248.

control, evaluation of baits in, U.S.D.A.
249.

control, tillage methods as aid, N.Dak.
695, S.Dak. 546.

control, use of mechanical bait spread-
ers for, 90.

eastern lubber, life history, food prefer-
ences, distribution, and control, Fla.
822.

immature, soybeans as host, Ill. 545.

nonmigratory, biology, ecology, and con-
trol, Iowa 247.

of Arizona, Ariz. 827.

problems associated with strip cropping,
547.

range, Wyo. 822.

rearing under laboratory conditions, 828.
research, S.Dak. 546.

studies, U.S.D.A. 88.

Grassland(s)—see also Grass(es), Lawns,
Meadows, and Pasture(s).

insects, Conn.[New Haven] 822.

maintenance in Vermont, Vt. 660.

overgrazed and normal, insect distribu-
tion and seasonal succession in, 248.

permanent fertility of, Pa. 482.

plowing up, and wireworms, 253.

Grazing—see also Range(s).

studies on northern Great Plains,
N.Dak. 699.

Grease removal from sewage, acceleration,
N.J. 428.

Grebes in British Columbia, 391.

Green manure—

crops, date-of-seeding test, Ariz. 791.

crops, variety tests, Ariz. 791.

fertilizer tests, S.C. 367.

Greenhouse, all-electric, 278, Wash. 428.

Ground-nut seed, mycoflora of, 529.

Grouse—

eastern ruffed, seasonal food preference
trends, 545.

ruffed, new parasite records from, 86.

sage, coccidiosis in, 719.

sage, insect food, 247.

Growth—

initiation, effect of pH concentration,
196.

substance(s)—see also Plant growth sub-
stances.

in plant propagation, nature and
use, Colo. 801.

Growth—Continued.

substance(s)—continued.

qualitative differences in capacity to
induce formative effects, 32.

synthetically produced, 39.

Grubs, white, see White grub(s).

Gryllotalpa hexadactyla, see Cricket, north-
ern mole.

Guanine as growth substance for *Phycomyces*,
194.

Guava(s)—

culture, P.R.U. 221.

culture and industrial possibilities.
P.R.U. 465.

Guinea pig(s)—

assay of oestrone in, 51.

embryos, death of, on diets low in vita-
min E, 896.

hereditary predisposition to sensitiza-
tion, 497.

reproductive organs, effect of diethyl-
stilboestrol, 655.

Gymnandrosoma n.sp. in Dominica, 551.

Gypsy moth—

as apple pest, Me. 248.

control, Mass. 820, U.S.D.A. 88.

in Pennsylvania, 547.

notes, Conn.[New Haven] 822.

project of Bureau of Entomology and

Plant Quarantine, 95.

threat of westward spread, 829.

Haemaphysalis humerosa—

isolation of strains of *Rickettsia burneti*
from, 111.

transmission of Q fever by, 111.

Haemonchus contortus—see also Stomach
worm.

spermatogenesis and oogenesis in, 713.

Hail as factor in regional climatology of
U. S., 766.

Hail in high and low latitudes, 631.

Hair, human, lanthionine isolation from, 166.

Hall's scale in California, U.S.D.A. 88.

Ham(s)—

cured, distribution of salt and water in.
improved method for determining, 259.

farm-cured, salt absorption in, hastening,
Pa. 836.

Hambletonia pseudococcinea, parasite of pine-
apple mealybug, P.R. 695.

Hamster—

golden, susceptibility to equine enceph-
alomyelitis, 718.

nutritional requirements, 698.

vitamin E and muscle degeneration in,
698.

Hanseniaspora causing date spoilage, 523.*Hapalia machaeralis*, biology, 395.*Haplothrips subtilissimus*, notes, 397.

Hawaii University notes, 610.

Hawthorns, Florida, ecologic notes, 487.

Hay—see also specific kinds

and grains in mixed ration, digestibility,
257.

and pasture management system v. pas-
turing alone, Mass. 793.

Hay—Continued.

- and silage, feeding value, Vt. 563.
 barn-dried, studies, 126.
 barn-dried v. field-dried, feeding value,
 Tenn. 411.
 cost of handling by different methods,
 Ohio 584.
 crop(s)—
 damage, relation to mirid plant bug,
 Wis. 546.
 emergency, comparison, [N.Y.] Cor-
 nell 53.
 emergency, in dry years, N.J. 366.
 removal, effect on soil fertility,
 Miss. 366.
 rotation, clover v. timothy as, Ind.
 659.
 variety tests, N.Mex. 366.
 curing, barn, summary, 433.
 dehydration, development of portable
 driers for, Ind. 725.
 drying in barn, studies, 127.
 fed once, twice, or three times daily to
 milking cows, efficiency of use, Idaho
 703.
 fields, residual effects of fertilizer applied
 to wheat and crop residues, Ind. 659.
 grasses, merits for landing fields, parks,
 and recreation fields, N.J. 366.
 making and storing, labor, power, and
 equipment requirements, Iowa 277.
 mixtures in Upper Peninsula, Mich. 705.
 oats-vetch mixtures v. crimson clover for,
 S.C. 367.
 production and preservation, methods,
 [N.Y.] Cornell 53.
 production, high quality, N.J. 660.
 quality in dairy rations, 105.
 seeding mixtures and techniques, [N.Y.]
 Cornell 53.
 v. grass silage for heifers, Vt. 563.
 vitamin A in, methods for conserving,
 N.J. 410.
 yield and quality on Clermont silt loam,
 effect of tile drainage, Ind. 659.
 yield from grasses, legumes, and their
 mixtures, Wis. 504.
 Haymaker, quick, experiment with, Wis. 574.
 Heats of combustion, studies, 166.
 Hedge plants for northern Great Plains, U.S.
 D.A. 676.
 Heifer(s)—
 dairy, development, Miss. 412.
 dairy, feeding and management, La. 412.
 growth rate and milk production, effect
 of rations and management, Mo. 103.
 supplements for native hay and dried beet
 pulp for, Wyo. 842.
 yearling, fattening for market, bluestem
 grass in, 98.
Hellogmodendrium hassalli in squirrels, 419.
Heliothis—
 armigera, see Bollworm, Corn earworm,
 and Tomato fruitworm.
 virescens, see Tobacco budworm.
 Hellebore, American, alkaloids of and toxicity
 to American cockroach, 249.

Helminth(s)—

- infections, natural resistance to, 110.
 of sheep and cattle, host specificity, 569.
 ova, embryonated, viability, apparatus
 for determining, 392.
 parasites of sheep, 716.
 Helminthological examinations, suspensions
 of feces for, useful mixing apparatus, 392.
Helminthosporium—
 cymbopogon n.sp., description, 533.
 tritici-vulgaris notes, U.S.D.A. 580.
Hemitarsonemus latus, see Broad mite.
 Hemlock—
 borer, studies, U.S.D.A. 88.
 Canada, effect of plant growth substances
 on rooting of cuttings, Mass. 800.
 propagation by cuttings, 376.
 western, decay, 543.
 Hemoglobin—
 formation, effect of iron, 310.
 methods of reading, comparison, 476.
 regeneration, effect of copper and iron
 on, 455.
 Hemoglobinometry studies, 620.
 Hemoglobinuria, bacillary, new-type vaccine
 for, 162.
 Hemorrhagic disease of newborn, 896.
 Hemp—
 manilla, see Abacá.
 sun, *Fusarium* wilt, 807.
 Hens—
 laying—see also Egg production.
 ad libitum and restricted grain and
 mash feeding, Ind. 698.
 battery management in Hawaii,
 Hawaii 701.
 calcium and phosphorus balances,
 408.
 calcium metabolism in, 559.
 calcium sources for, Mass. 837.
 carbonic anhydrase activity of ovi-
 duct, 408.
 effect of diminishing proportion of
 starch in feed, Ky. 558.
 feeding systems for, Pa. 837.
 Irish coral sand as source of lime
 for, 260.
 management and progeny testing in
 individual cages, N.J. 403.
 mineral nutrition studies, 559, 838.
 selenium rations for, linseed meal
 as supplement, S.Dak. 554.
 soybean meal for, Ind. 698.
 soybean meal replacement for dried
 buttermilk, N.Mex. 403.
 negative calcium balances after laying,
 S.C. 403.
 range for, restricted feeding with, Mass.
 837.
 reproduction in, need for pantothenic
 acid and an unidentified factor, 409.
 selection of strains for high and low egg
 albumin quality, N.Mex. 403.
 White Leghorn, albumin index in, inherit-
 ance, Wash. 404.
 Herb seed production, Ariz. 798.

- Herbage, phosphorus and calcium content, effect of different fertilizer treatments, Ky. 769.
- Herbivora, deposition of fat in, [N.Y.] Cornell 99.
- Heredity—
- of barley fertility in lateral spikelets, 786.
 - of cross- and self-sterility and self-fertility in beets, 652.
 - of dwarfism in sheep, 209.
 - of hemophilia-like condition in swine, 361.
 - of induced mutations in *Neurospora tetrasperma*, 653.
 - of *Melampsora Uni* pathogenicity, 654.
 - of oat smut resistance in Navarro hybrids, 786.
 - of seed longevity in corn inbreds and hybrids, 206.
 - of white belly in mice, 48.
 - role of chromosomes in, [N.Y.] Cornell 53.
- Hermaphrodites, true, mammalian, accessory reproductive tract in, 361.
- Herring fish meal in poultry rations, Wash. 404.
- Hesperidin, effect on vitamin K-deficient chicks, 560.
- Hessian fly—
- resistance in wheat, variety nursery for study, Ill. 546.
 - resistant wheat variety, production, U.S.D.A. 88.
- Heterocaryosis and variability, 650.
- Heterosporium* genus, studies in, 487.
- Hevea*—
- brasiliensis*, culture, P.R. 668.
 - seedlings, methods of splitting, 802.
- Hexamitiasis in chicken and turkey, 425.
- Hibiscus diseases, new, in Gulf coast area, 245.
- Hickory—
- and other trees, boron content, 190.
 - perennial woody gall on, 67.
 - rot and cankers, cause, 389.
 - shuckworm on pecan, control, U.S.D.A. 88.
- Hippodamia koebelei* n.sp. from Mexico, description, 549.
- Histidine preparation, new method, Conn. [New Haven] 760.
- Hog cholera—
- antiserum, virus, and vaccines, potency and purity tests, Ind. 709.
 - tissue vaccine, immunological studies, 424.
 - virus, Ind. 710.
- Hog-kidney worm, control, 116.
- Hogs, see Pig(s) and Swine.
- Holly—
- American, dying back of branch tips, cause, N.J. 378.
 - cut, control of defoliation by hormone sprays, 523.
- Hollyhock leaf curl, notes, 76.
- Home(s)—
- architected, for American farms, 484.
 - economics teachers, supply and demand, factors affecting, Iowa, 302.
 - grounds, attractive, effect on morale for victory, Miss. 159.
 - management studies, Ill. 608.
- Homocysteine, S-(β -amino- β -carboxyethyl)-, synthesis, 166.
- Honey(s)—
- as sugar substitute for cakes, Colo. 884.
 - of Florida, composition and nutritive value, Fla. 880.
 - production, effect of meteorological factors, Iowa 247.
 - transformation of nectar into, factors involved, Iowa 247.
- Honeydew melon anthracnose control in storage, Colo. 238.
- Hop—
- aphid control with dinitroresol, 896.
 - downy mildew, degrees of infection, scale for determining, 238.
 - seeds, germination, effect of temperature alternation, 781.
- Hoplocrates* genus, monograph, 402.
- Hordeum*—
- cytology and genetics of, 81.
 - species, chromosome numbers in, 359.
- Homodendrum resiniae* on wood impregnated with creosote and coal tar, 819.
- Hormone(s)—
- A and initial male reaction in *Achlya*, 488.
 - and endocrine system, 498.
 - gonadotropic, see Gonadotropic.
 - lactogenic activity, effect of thiol compounds, 267.
 - lactogenic, reducing groups, effect of thiols, 267.
 - mammogenic, studies, Mo. 103.
 - plant, see Plant growth substances.
 - presence and effects in sexual reproduction, Mo. 32.
 - sex, effect on sexual behavior in fowls, 655.
 - sex, of pigs, differences between lines, 209.
 - sex, sex-inverting power, demonstration, 655.
- Horned passalus parasitized by *Zelia vertebrata*, 553.
- Hornfly—
- of cattle, control, P.R. 695.
 - studies, U.S.D.A. 89.
- Hornia* genus, bionomics, 549.
- Horse(s)—
- and mules, situation and future trends, 97.
 - Colorado Ranger, leopard spotting and color alteration in, 48.
 - epithelial tumors of, 718.
 - light, production and college program, 97.
 - medium weight draft, breeding and development, 97.

Horse(s)—Continued.

- number on Illinois accounting farms, Ill. 583.
- parasites, phenothiazine for control, 117.
- production programs for agricultural colleges, 97.
- sterility in, and vitamin C, 97.
- strongyles in, control [N.Y.] Cornell 109.
- twinning in, 208, 657.
- unusual parasites of, 718.
- young, incoordination in, Ky. 851.

Horsefly, transmission of equine infectious anemia by, 718

Horsenettle, white, control methods, Ariz. 791.

Horseradish culture, Ill. 514.

Horse sickness—

- African, virus, particle size of, 851.
- electrophoresis of neurotropic virus and its neutralizing antibodies, 851.
- neurotropic virus of, transmitted immunity, 851.

Horticultural research, correlation from ranks, procedure, 220.

House(s)—

- construction, use of locally available farm materials and labor in, 163.
- dermestid larvae injurious in, [N.Y.] Cornell 90.
- in California, air conditioning for, Calif. 729.
- repairs, treatise, 729.

Housefly (ies)—

- as vector of food poisoning organisms in food-producing establishments, 553.
- control, relation to poliomyelitis, 553.
- standardized, method of obtaining, 821.
- Trichomonas foetus* in, viability, 392.

Household equipment—

- electric mixers and beaters, Ind. 754.
- studies, Me. 322.

Housing—

- and household operation, family expenditures for, U.S.D.A. 159.
- for health, 608.
- in southern California, 897.
- low-cost, case studies in, 128.

Human beings of different ages, nutritive requirements, Colo. 740.

Humidistat, illustrated description, 491.

Humus theory and role of humus in plant nutrition and Liebig, 616.

Hunterellus hookeri, notes, 553.

Hurricane station, reliable, value of, 181.

Hyblaea puera, biology, 395.

Hybridization, interspecific, in flowering plants, endosperm as barrier, 46.

Hydnum erinaceus on sprout oak stands, U.S.D.A. 84.

Hydrochloric acid gas poisoning from testing salt-treated cream, 337.

Hydrogen fluoride, localized injury to plant organs from, 230.

Hydrogen-ion concentration—

- and growth initiation, 196.
- and plant nutrition, 186.

Hydrogen-ion concentration—Continued.

- determination at soil moisture contents approximating field conditions, 770.
- lowering by soil nitrates, Mass. 769.

Hydrogenase—

- in *Azotobacter*, properties, 33.
- in nitrogen-fixing organisms, 195.

Hydrology Conference, proceedings, 631.

Hydrophobia, see Rabies.

Hydrophyllaceae, chromosome numbers in, 495.

Hydroxyl ions adsorption by soils and minerals, relation to pH, 642.

Hylastinus obscurus, see Clover root borer.*Hylemya*—

- brassicae*, see Cabbage maggot.
- cilicrura*, see Seed-corn maggot.

Hymenolepis mastigopraedita from pintail duck, 419.

Hymenoptera—

- deposition of nonviable eggs by, 821.
- parasitic, of Samoan Islands, check list and new species, 554.
- sex differentiation in polyembryonic proclivity, 247.
- sex ratio in, 553.

Hypera—

- brunneipennis*, studies, U.S.D.A. 88.
- postica*, see Alfalfa weevil.
- two closely related species, value of accurate classification, 89.

Hyperthyroidism, experimental, coenzyme I content of rat tissues in, 746.

Hypoderma lineatum, see Cattle grubs.

Hypophysis, see Pituitary.

Hypoprothrombinemia, induced, and vitamin C excretion, 698.

Hypoxanthine, growth substance for Phycomyces, 645.

Hysterectomy of pregnant rabbits, effect on corpora lutea, 51.

Ice cream—

- bacterial population, Ill. 562.
- consumer acceptance and dispensing qualities, effect of composition and serving temperature, Mo. 103.
- emulsifier, soybean lecithoprotein as, Ind. 704.
- freezers, sanitizing with hot water, steam, and chlorine, comparison, 270.
- properties, effect of cultures and relation to acid standardization, Mo. 417.
- properties, effect of dextrose and sucrose sugars on, Mo. 417.
- research in, 108.
- research, use of moving pictures in, Mo. 103.
- shrinkage in, control, 108.
- stabilizers, newer, and functions, 108.

Idaho Station notes, 468.

Idaho Station report, 755.

Illinois Station report, 609.

Illinois University notes, 610.

Illumination climate and radiation intensity, 181.

Incubation, see Eggs.

Incubator(s)—

- electric, new type [N.Y.] Cornell 120.
- electrolytic heater for, 127.

Index numbers of production, prices, and income, Ohio 284, 584.

Indian-meal moth, notes, 551.

Indiana Station notes, 160, 468, 756.

Indiana Station report, 755.

Indigofera hirsuta, strain tests, Fla. 791.

Infantile paralysis, *see* Poliomyelitis.

Infants—*see also* Children.

- magnesium balance studies, 596.

- male, growth and development on evaporated milk, 607.

- newborn, prothrombin in, 461.

- newborn, vitamin K requirement, 607.

Influenza, equine, studies of serums from horses convalescent from, 718.

Inheritance, *see* Heredity.

Inositol—

- biological specificity, 594.

- determination method, 476.

- factor in regeneration of hair in spectated eye in rats, 316.

Insect(s)—*see also* Entomology.

- abundant during 1941, Conn. [New Haven] 822.

- active throughout winter at Vancouver, B. C. 90.

- affecting man and animals, U.S.D.A. 89.

- and other enemies of the hacienda, 546.

- and pests of Florida vegetables, Fla. 823.

- attacking human food, Ill. 546.

- attacking stored tobacco and tobacco products, control, U.S.D.A. 823.

- baits, mineral oil, spontaneous heating in, Ill. 546.

- beneficial, introduction and propagation, Fla. 822.

- beneficial, introduction of new species, P.R. 695.

- biological control in Japan, problems, 89.

- cage for confining to plants, 821.

- cage, small, 247.

- classification, accurate, value, 89.

- cold-hardiness of, relation to unfreezable water, 821.

- collecting and preserving, 545.

- common names approved by American Association of Economic Entomologists, 246.

- conditions in Florida, 545.

- control methods, 547.

- control, radiant energy for, N.J. 391.

- damage appraisal, annual, 247.

- destructive European, new to United States, 822.

- eggs, locating in plant tissues, 821.

- fauna, coleopterous, of North America, origin and distribution, 89.

- forest, *see* Forest.

- garden, control, Mo. 393, N.J. 391, N.Mex. 393.

- hemipterous, studies, U.S.D.A. 88.

- identification work, U.S.D.A. 89.

- immature, collecting and preserving, 545.

Insect(s)—Continued.

- important, of year, Del. 245.

- important to crops and control in Australia, 822.

- in wild habitats, effect of cold weather, 545.

- injurious to crops, *see special crops*.

- inspection and quarantine work, U.S.D.A. 89.

- of Bermuda, food plants, of, 394.

- of bramble and bush fruits, Mo. 393.

- of Californian Islands, 89.

- of New Mexico, control, N.Mex. 248.

- of North Dakota, control, N.Dak. 248,
- of stored products, mixed fumigants suitable for, 92.

- oil-nicotine spray for, tests, Ky. 822.

- orchard, *see* Orchard insects and Fruit insects.

- parasites, introduction into Chile, 89.

- pests of New York, N.Y. State 402.

- pests, periodical recurrence, Mo. 85.

- physiological relations and host plants, 91.

- physiology, U.S.D.A. 89.

- plantation, in Lake States, U.S.D.A. 88.

- reaction to different wavelengths of light, 392.

- relation to azalea flower spot, U.S.D.A. 243.

- role in spread of plant diseases, 229.

- scale, *see* Scale insect(s).

- secretions of, U.S.D.A. 89.

- suitable test for contact insecticides for, 87.

- temperature preference, 90.

- types, 90.

Insecticidal properties of plant products, survey, 87.

Insecticides—*see also* Spray(s) and specific forms.

- advances in research, Del. 245.

- airplanes for application on cranberry bogs, N.J. 391.

- and fumigants, tests, U.S.D.A. 89.

- and fungicides, analyses, Me. 221.

- application of, U.S.D.A. 89.

- contact, facts and theories, 547.

- contact, studies, 87.

- contact, studies, laboratory spraying apparatus and technic for, 87.

- derived from plants, 821.

- dispersing machine, description, 124.

- for orchard use, Conn. [New Haven] 822.

- for victory gardens, S.Dak. 695.

- metaldehyde determination in, 335.

- organic chemicals as, Ind. 694.

- particle size for cotton insects, U.S.D.A. 88.

- petroleum oils for, 827.

- studies, Mo. 85.

- use, 395.

Insemination, artificial—

- associations, advantages to dairymen from, N.J. 360.

- Insemination, artificial**—Continued.
 equipment for, Mo. 47.
 in poultry, Tenn. 860.
 in sheep, Mo. 47.
 methods of increasing usefulness in field, [N.Y.]Cornell 47.
 of bees, studies, U.S.D.A. 88.
 of cows, effect of diluters and storage on fecundity of semen, 657.
 of cows, results of four years of, 104.
- Insulin**—
 content of rat's pancreas, effect of purified pituitary preparations, 362.
 effect on blood sugar in chicks, 790.
 pancreatic, of rats, effect of thyroxin, 503.
- Insurance, social, and agricultural workers,** 582
- Intersexuality, experimental, in rat embryos,** 499.
- Interstitial cell stimulation and luteinization, effect of pituitary,** 655.
- Intestinal**—
 bacteria, role in pectin decomposition, 141.
 mucosa, dipeptidases of, 746.
 myiasis, *Sarcophaga bullata* as cause, 553.
 stasis and low mineral diets, 594.
- Iodine**—
 added to casein and skim milk, effect of method on thyroid activity, 267.
 effect on structure and activity of tobacco mosaic virus, 237.
 in nutrition, 598.
 in thyroid determination, modified method, 178.
 sources and distribution in South Carolina, 30.
- Iowa College notes,** 467.
- Iowa State parks, educational program in, development,** 191.
- Iowa Station notes,** 467, 756.
- Iowa Station report,** 322.
- Ips spp. attacking pines,** 832.
- Iridomyrmex humilis*, see Ant(s), Argentine.**
- Iris* spp., development and relative growth in ovaries,** 652.
- Irish moss, nutritive value,** 591.
- Iron**—
 and copper, effect on hemoglobin regeneration, 455.
 calcium, phosphorus, and nitrogen metabolism and requirements of young women, Nebr. 746.
 determination in soils and silicates, 334.
 effect on hemoglobin formation, 310.
 in biological materials, microestimation, method, 475.
 in cereals, 475.
 in different diets, determination, 761.
 in plants and chlorophyll, 356.
 in potatoes, effect of cooking method, 886.
- Iron**—Continued.
 metabolism and requirement of young women, Nebr. 747.
 response to in anemia of vitamin C deficiency, 154.
 spectrophotometric determination, 761.
- Ironweed, Coleoptera associated with,** 549.
- Irrigation**—
 channels, measuring water in, U.S.D.A. 277.
 of crops, trend in, N.J. 428.
 of soils, time and amount, Wash. 343.
 project settlers, need for capital and credit by, Idaho, 729.
 pumping with electric power, 279.
 water costs, ability of farmers to pay, Ariz. 866.
 water losses, reduction, Utah 726.
- Ixodon torosus*, isolation of strains of *Rickettsia burneti* from,** 111.
- Ixodes***—
californicus, host poisoning by, 90.
californicus problem in British Columbia, 97.
dentatus, parasite of, 553.
- Ixodiphagus tianus*, parasite of American dog tick,** 553.
- Jacks, physiology of reproduction, studies,** Tenn. 360.
- Jamaica, climatic map of, on Köppen system,** 182.
- Japanese beetle**—
 as host and disseminator of type A milky disease, 821.
 as rose pest, 252.
 control, N.J. 391.
 distribution, effect of host plants, 830.
 larvae, milky disease of, colonization, 393.
 milky disease, an effective control remedy, 252.
 populations, campaign to reduce, Del. 245.
 studies, Conn. [New Haven] 822, U.S.D.A. 88.
 traps, effectiveness, 830.
- Jassids, transmission of wallaby ear disease of corn by,** 812.
- Jatropha cordata*, developmental anatomy,** 31.
- Jellies, fruit, role of pectin in,** Del. 17.
- Jelly strength, effect of inversion of sugar on,** Del. 165.
- Jennets, reproductive performance, seasonal effect,** 208.
- Jessamine, orange, mineral deficiencies, Fla.** 806.
- John's disease**—
 efficiency of chaulmoogra oil for, Ill. 564.
 of cattle, diagnosis, 713.
 of sheep, 716.
- Johnin studies,** 711.
- Johnson grass control, N.Mex.** 366.
- Johnson grass eradication, Miss.** 660.
- Joba, economic value, Ariz.** 791.
- Juglans intermedia*, microsporogenesis in,** 81.

June beetle, green—

- grubs in bluegrass and in tobacco beds, Ky. 822.
- larvae in tobacco plant beds, control, S.C. 393.
- larvae in tobacco seedbeds, U.S.D.A. 88.

Juniper propagation, Mass. 800.

Juniperus, Ontario species, wood structure, 495.

Kabatiella microsticta on lily-of-the-valley, 82.

Kansas College notes, 467, 900.

Kansas Station notes, 467, 900.

Kentucky Station notes, 467, 610.

Kentucky Station report, 899.

Kentucky University notes, 610.

Keratitis in cattle, field experiments, 272.

Kerosene-rotenone spray, caution urged in use, 547.

Ketosis—

- control, 163.
- in cattle and sheep, control, Ill. 564.
- in dairy cattle, effect of glucose therapy and pasture feeding, 568.

Kidney beans, improvement in Puerto Rico, P.R.U. 465.

Knight, H. G., editorial, 469.

Kudzu hay—

- feeding experiment with cattle of various ages, Miss. 700.
- for fattening steers, Fla. 833.

Labor, *see* Agricultural labor.

Laboratory—

- Hudson Valley, in new location, N.Y. State 899.
- technic, use of plastic ethyl methacrylate in, 628.

Lactalbumin, lanthionine isolation from, 166.

Laotaria glaucescens, mushroom poisoning by, 349.

Lactation—

- and parathyroid glands in rat, 705.
- dietary requirements, 592.
- in virgin animals, artificial induction, 845.
- new dietary factor essential for, 593.
- physiology and biochemistry, new developments in, 265.

Lactic acid—

- bacteria, differentiation of similar types, 106.
- bacteria, growth, and manganese, 597.
- fermentative production, use of agricultural products in, Iowa 165.
- formation in alcoholic fermentation by yeast, 473.

Lactobacillus—

- acidophilus*, oral, and saliva chemistry, relation to dental caries, 890.
- for assay of riboflavin, nomenclature and characteristics, 33.
- species, characterization, 34.

Lactogenic hormone, pituitary, reactions with iodine, 106.

Lactose, α and β -, determination in dried milk and dried whey, 175.

Ladybeetle effective against bamboo scales, P.R. 695.

Lagochirus araneiformis, notes, 95.

Lakes and ponds, uses and management, N.Dak. 820.

Lamb(s)—

- beet tops and beet pulp for, S.Dak. 554.
 - brooders, Wash. 428.
 - castrating and docking, comparative tests, Ky. 834.
 - dead of overeating, toxicity of intestinal filtrates from, 116.
 - dysentery, Wash. 418.
 - fattening, corn and cottonseed meal v. alfalfa and prairie hays, Okla. 101.
 - fattening, effect of fluorine in rock phosphate as mineral supplement, 557.
 - fattening rations, Wyo. 834.
 - feeder, worm-infested, comparison of remedies, N.Dak. 273.
 - feeding in irrigated valleys, N.Mex. 437.
 - feeding seasons, returns per head and feed costs, N.Mex. 434.
 - feeding test, N.Dak. 700.
 - feeding with sugar beet tops, molasses, and beet pulp, Idaho 697.
 - feedlot, diseases, 570.
 - feedlot, losses in, etiological factor in, 97.
 - marketing, Iowa 283.
 - native mountain and northwestern, comparison, Tenn. 360.
 - Navajo, growth, effect of environmental variations, 208.
 - New Zealand Romney, birthcoat, Mendelian situation in, 496.
 - nicotinic acid and manganese requirements, [N.Y.]Cornell 99.
 - nicotinic acid in, 150.
 - on different pasture, fattening value of rations fed, Ill. 554.
 - purebred ewe, effects of breeding, N.Dak. 788.
 - sheared and un-sheared, comparison, Ky. 834.
 - stiff disease, cause, [N.Y.]Cornell 99.
 - suckling, creep feeding cracked corn for, Ky. 834.
 - suckling, rations for, Wash. 404.
 - tenderness, effect of degree of fatness, 98.
 - western, fattening, 97.
 - wobblers and ataxic, similarity between, 855.
 - worm parasites of digestive tract, control, [N.Y.]Cornell 109.
 - worms in, eradication with chenopodium, S.Dak. 564.
 - yearling, fattening, protein supplements for, comparison, [N.Y.]Cornell 99.
- Lamp, RS-4, studies, 278.
- Lampetia equestris*, *see* Narcissus bulb fly.
- Land(s)—*see also* Farm land.
- agricultural, ownership and operating tenures in Casa Grande Valley, Ariz. 438.
 - classes, data as to areas in and relation to farm factors, Del. 283.
 - classification in Missouri, Mo. 22.

Land(s)—Continued.

classification, productivity indices in, S.C. 435.

economics, content, and research methods adapted to needs, 582.

grant colleges, *see* Agricultural colleges.

market and farm mortgage debts, 582.

measurement of evaporation from, U.S. D.A. 340.

of U. S. D. A. Forest Service, making available to laborers, improvement of system, P.R.U. 284.

overgrazed and badly eroded, revegetation on, Ariz. 768.

public, in North Dakota, management, N.Dak. 867.

purchase by farmers and mortgage foreclosure, S.Dak. 438.

resting, for future gains, N.J. 639.

selling values relative to wheat yield, Idaho 729.

settlement—
in Willamette Valley, Benton Co., Oreg. 878.

isolated, problems of, U.S.D.A. 300.

new, problems in, La. 300.

settlers on irrigation project, need for capital and credit by, Idaho 729.

tenure classification and areas in Kentucky, Ky. 438.

tenure in State, Mass. 866.

tenure status, effect on farm life, S.Dak. 737.

terraced, plowing, U.S.D.A. 430.

terraced, soil movement within surface profile, 343.

transfers, analysis in selected counties, Iowa 283.

waterlogged, overlying an impervious layer, pressure and streamline distribution, 634.

Yuma mesa, Ariz. 768.

Land use(s)—

adjustment(s)—
in Buffalo Creek grazing district of Montana, U.S.D.A. 285.

in Washington, Wash. 435.

needed on farms in Cass Co., Ind. 730.

better, for Oklahoma, Okla. 638.

conditions on Box Elder Creek project, Nebraska, U.S.D.A. 25.

in Pope County, Ill. 583.

in Sussex County, Del. 436.

interrelation in rural Massachusetts, Mass. 292.

on farms in southern limestone area, Ind. 730.

planning, basic maps and materials available, Tenn. 286.

planning, relation to soil science, 768.

trends in eastern highland region, Ky. 877.

Landlord-tenant compensation, Ind. 730.

Lanthionine, isolation from human hair, chicken feathers, and lactalbumin, 166.

Laphygma frugiperda, *see* Armyworm, fall.

Lard(s)—
and lard substitutes, production and storage, Iowa, 283.

local, chemical studies, P.R.U. 165.

nutritive properties, 449.

Larks, North American, life history, 545.

Larkspurs, North American, systematic relations, 32.

Larra—
americana—

dispersion in Puerto Rico, 256.

establishment on changa, P.R.U. 248.

introduction and establishment in Puerto Rico, 89.

spp. parasites of mole cricket, 97.

Laschia sabalenensis n.sp., description, 543.

Lasioderma serricornis, *see* Cigarette beetle.

Laspeyresia caryana, *see* Hickory shuckworm.

Laspeyresia interstinctana, notes, Del. 245.

Latin America as source of strategic materials, 584.

Lawngrass breeding, N.J. 366.

Lawns—
planting and maintenance, Ala. 803.

protecting from grub injury, N.Y.State 831.

Layia, genus, relationships, 485.

Lead—
arsenate spray residues, toxicity to pigs, Wash. 418.

deposition and retention on apples from various spray mixtures, 827.

in biological materials, determination, 476.

in sugars and sugar products, determination, 476.

poisoning, effect of vitamin C on, 318.

sulfate, decomposition temperature, 173.

with salicylaldehyde, separation and determination, 173.

Leaf (ves)—
at different levels on stem, changes in, invertase action, 489.

carotene determination, 337.

curl diseases in South Africa, 76.

excised, water loss from, 197.

extract, irradiated, comparative transmission spectrograms, 472.

growth, effects of photoperiod, 203.

miner, serpentine, in gerberas, control and life history, 256.

miners, notes, N.Dak. 248.

oxidation-reduction reactions in, 485.

rollers, pyrethrum for control, Ill. 546.

spot bacteria, isolation from soil, 229.

state of pigments in, 485.

tiers, pyrethrum for control, Ill. 546.

Leafhopper(s)—*see also special hosts*.

control, nonarsenical codling moth sprays for, Ill. 546.

Leatherjackets, sampling for with orthodichlorobenzene emulsion, 552.

Lecanium nigrofulvatum, *see* Terrapin scale.

- Legume(s)**—*see also* Green manure and Alfalfa, Clover, *etc.*
 and grasses grown in associations, inter-relations, Ind. 659.
 and Rhizobia, 350.
 bug control, dusts for, Idaho, 694.
 establishment in permanent pasture without plowing, N.J. 366.
 forage, merits for hay and pasture v. birdsfoot trefoil [N.Y.] Cornell 53.
 forage production, P.R.U. 213.
 grasses, and grass associations for pastures, [N.Y.] Cornell 53.
 herbage, British, diseases, 810.
 inoculants, inspection, Ind. 341.
 inoculants, types, comparison, Ill. 504.
 inoculation—
 methods, Fla. 792.
 on New Jersey soils, N.J. 342.
 problems and value of commercial cultures, Iowa 183.
 nodules, molybdenum in, 350.
 number of nodules developed, relation to strain of *Rhizobium* supplied, 36.
 nurse crops for, management, Mo. 213.
 pasture, studies, Fla. 792.
 root nodule bacteria, physiology, respiration methods in study, 350.
 seed scarifier, Tenn. 428.
 seedling emergence studies, 31.
 seedling stands, effect of pythiaceus and other fungi, Iowa 228.
 seedlings on burned-over land, Idaho 659.
 silage from, nutritive value, Tenn. 404.
 summer, prevention of loss of nitrogen from, 162.
 supplied with free or bound nitrogen, rate of photosynthesis, 784.
 symbiosis and nodule bacteria, 37.
 variety tests, Fla. 791, Iowa 212.
 viruses transmissible to tobacco, Fla. 806.
 weevil, studies, U.S.D.A. 88.
 winter, harvesting seeds to meet farm needs, Miss. 660.
 yield of nodule bacteria, effect of aeration and soil temperature, 777.
- Lemon grass**—
 oil and citral content, P.R. 617.
 tonnage, increase, effect of fertilizers, P.R. 617.
- Lemon packing houses**, efficiency of operation, Calif. 441.
- Lemon, rough**, as rootstock, present status, 224.
- Lemon trees**, cold-injured, rebuilding, 675.
- Lepidoptera**, distribution in Pacific Island groups, 89.
- Lepidopterous larvae**, food plants, 90.
- Leptota**—
aurantiogemmata n.sp., description, 487.
morgani, poisoning by, 35.
- Leptosphaeria sacchari**, notes, 535.
- Leptosira tetrohaemorrhagiae** in man, dogs, and rodents, 112.
- Lespedeza(s)**—
 as cover crop for peach orchards, Ill. 516.
 composition, Tenn. 827.
 fertilizer tests, Fla. 791.
 in Oklahoma, taxonomic treatment, 194.
 Korean, characteristics and culture, Kans. 217.
 Korean, selection and improvement, Del. 212.
 lead annual hay plants, Miss. 366.
 nurse crops for, Ky. 792.
 resistance to grasshopper destruction, Ill. 545.
 value as maintenance ration for beef cattle, Miss. 699.
 variety tests, Fla. 791, Iowa 212, Tenn. 367.
 weed control by cleaning of seed, Ill. 573.
- Lettuce**—
 big vein in Ontario, 229.
 big vein symptoms, expression of, effect of temperature, 538.
 breeding, Pa. 513.
 breeding and selection, Ariz. 798.
 calcium, phosphorus, and iron in, range of, Ariz. 880.
 California head, calcium in outer and inner leaves, 142.
 crisp-head, cultural studies, Fla. 799.
 crisp-head strains, relation to temperature and time of planting, Fla. 799.
 culture for satisfactory heading, N.Mex. 371.
 culture tests, Fla. 799.
 diseases in North Carolina, U.S.D.A. 66.
 downy mildew control, Fla. 806.
 fertilization, Ariz. 798.
 fertilizer tests, Fla. 799.
 improvement, [N.Y.] Cornell 58.
 varieties, Fla. 799.
 variety tests, Fla. 799.
 yellows, control [N.Y.] Cornell 90.
- Leucocytozoon smithi*, studies, 724.
- Leuconostoc* spp., slime production by, 33.
- Leucoptera coffecella*, notes, P.R.U. 248.
- Leucosis**—
 avian, complex, effect of rearing environment, 571.
 fowl, agent, production of antibodies against, Iowa 270.
 fowl, and nonspecific enteritis of chickens, radiant energy in study, Iowa 270.
 fowl, resistance to, effect of homozygosis of poultry inbred lines, Iowa 209.
 fowl, resistance to, mode of inheritance, Iowa 270.
 studies, Ind. 709, Mo. 108.
- Leukemia**—
 and allied conditions, etiology, Fla. 851.
 and bovine lymphocytoma, relation, 714.
 in F strain of mice, 655.
- Lice**—
 head, eradication, 397.
 of livestock, Mo. 696.
 on Illinois cattle, Ill. 546.
- Liebig, Justus von**, man and teacher, 616.

Light—

- action on cellulose, 170.
- of different wavelengths, reaction of insects to, 392.
- photodynamic action and diseases caused by, 598.
- use in agriculture, Idaho 725.

Lightning protection for shade trees, 120.

Lignin—

- chemical, biological decomposition, 85.
- relation to absorption of minerals by plants, Mass. 760.

Lilac propagation, Mass. 800.

Lilium sulphureum × *L. henryi*, recent hybrids of, 31.

Lily—

- bulbs, Easter, distribution of auxins in, 770.
- mosaic disease, insect vectors, U.S.D.A. 88.

Lily-of-the-valley—

- leaf spot, cause, 82.
- seeds, dormancy in, 643.

Lima beans, *see* Beans, lima.

Lime—*see also* Calcium and Liming.

- downward movement, relation to pasture fertilization, 641.
- requirement of Massachusetts soils, factors affecting, Mass. 769.

Lime(s) (fruit)—

- Persian, analytical studies, Fla. 328.
- trees, Tahiti, bark disease of, Fla. 806.

Lime-phosphate studies, Tenn. 342.

Lime-potash studies, Tenn. 342.

Limestone—

- fineness for Illinois, Ill. 482.
- residual value, Ill. 482.

Lime-sulfur—

- and oil, effectiveness in combination and separately, Wash. 303.
- sprays, increasing efficiency, Wash. 393.

Liming—

- Iowa soils, Iowa 642.
- materials, consumption, increase in, N.J. 342.
- materials, times of year of greatest penetration, N.J. 342.
- Missouri soils, Mo. 189.

Linkage studies with jerker, a new gene mutation in mice, 48.

Linoleic acid requirement, possible sparing action of pyridoxin on, 745.

Lined oil, ultraviolet absorption spectra, 176.

Lipase action, 413.

Liponyssus bacoti, *see* Rat mite, tropical.

Liponyssus spp. of fowl, dog, and man, 851.

Liquid-in-liquid solutions, concentration in, rapid determination, 831.

Liriomyza flaveola, *see* Leaf miner, serpentine.

Listerella infection in a calf in North Wales, 272.

Listerellosis in flock of purebred native sheep, 423.

Listeria—

- infection in cattle, 714.
- infection, outbreak in sheep, 115.
- monocytogenes* growth requirements, 711.
- monocytogenes* infection, outbreak in Oregon sheep, 118.
- spp. in chickens and sheep, 419.

Listroderes obliquus, *see* Vegetable weevils.

Listronotus latiusculus (oregonensis), *see* Carrot weevil.

Lithium absorption—

- and excretion by man, 748.
- absorption, translocation, and fate in wheat seedlings, 198.

Lithium shortage may be met by soil bacteria, N.Y.State 773.

Liver—

- biotin isolation from, 624.
- extracts, effect on achromotrichia in rats, 150.
- fluke, losses from, in sheep and cattle in intermountain States, Utah 272.
- fluke pathology in cattle produced by, Oreg. 854.
- meal in poultry rations, Wash. 404.
- weight of hypophysectomized rats, effect of purified pituitary preparations on, 361.

Livestock—*see also* Animal(s), Mammals, Cattle, Sheep, *etc.*

- auctions, operation, expenses, and charges, Ill. 584.
- breeding and genetic studies, Ill. 496.
- breeding, design of experimental comparisons between lines, 496.
- cooperatives, effectiveness, Iowa 283.
- diseases, *see* Animal disease(s) and *specifio kinds*.

feeding, mineral deficiencies and plans of mineral experiment, Miss. 835.

industry of South and parasitism, 567.

Kentucky, auction markets as outlets, Ky. 866.

Kentucky, changes in market outlets for, Ky. 866.

lice and mites of, Mo. 696.

marketing—

and purchasing, types of outlets used by Ohio farmers, Ohio 284.

and stockmen, effects of war on, Ohio 584.

from farm to processor, Ind. 729.

in North Dakota, N.Dak. 871.

wartime problems in, N.Dak. 730.

mineral nutrition problems, use of laboratory animals for, Fla. 883.

motor transportation, Ohio 298.

numbers and values, increasing, N.Dak. 284.

nutrition problems, physiological approach to, 97.

nutrition, vitamins essential in, 834.

on farms, Okla. 435.

on Mississippi farms, Miss. 284.

poisoning, *see* Plants, poisonous, and *specifio plants*.

Livestock—Continued.

- prices, application of byproducts to, 98.
- production effect of increased pasture and roughage, 98.
- pure breeds, amount and kind of in-breeding producing, Iowa 209.
- ranches, capital invested and returns on, Wyo. 867.
- rations, fundamentals of, 404.
- rations high in vitamin K, compound-ing, Iowa 257.
- reproduction relation to nutrients, [N.Y.] Cornell 99.
- selenium poisoning of, 98.
- shipping associations, cooperative, number in State, number of members and livestock handled, Ill. 583.
- Texas, breeds of, 98.
- urinary calculi in, relation to vitamin A deficiency, Colo. 851.

Living conditions in Pope County, Ill. 583.

Locker plants—

- development in South Dakota, S.Dak. 873.
 - growth and development, N.Y.State 899.
- Locust, black (tree)—
- borer attack on sprout growth, control, U.S.D.A. 88.
 - pretreating seed, N.Y.State 226.
 - seedling growth, effect of subsoil acidity and fertility, 66.
 - seedlings, effect of soil aeration on foliation, 804.
 - virus disease, 389.

Locust (insect)—

- brown, poison bait for, 397.
- lubberly, migrations and food preferences, 547.
- migratory, studies, 394.

Lodgepole needle miner, control, 254.

Lonchocarpus spp., culture and handling, P.R. 668.

London purple, use of term, 821.

Loquat—

- crown rot, description, 387.
- mineral deficiencies, Fla. 806.
- Louisiana Station notes, 467, 611.
- Louisiana University notes, 611.

Lucilia sericata, unusual experience with, 247.

Ludius acerpennis destructor, life cycle, variation in length, 247.

Lumarith as substitute for glass in seedbed sash, Conn.[New Haven] 797.

Lunches—

- rural school, experiments with, 306.
 - school, in country and city, U.S.D.A. 306.
- Lupine, soil and nutrient requirements for, [N.Y.] Cornell 64.

Lycopersicum spp., susceptibility to *Cladosporium* leaf mold, Mass. 807.

Lygus—

- hesperus*, effect on sugar beet seed production and control, U.S.D.A. 88.
- pratensis*, see Tarnished plant bug.
- spp. studies, N.Mex. 893.

Lymphocytoma, bovine, and leukemia relation, 714.

Lyperosom monenteron from liver of ruffed grouse, 86.

Macadamia nuts, analyses and vitamin assays, 144.

Machinery, see Agricultural machinery.

Macrocentrus—

ancyliovorus, notes, Va. 824.

delcatus, notes, Va. 824.

Macroductylus subspinosus, see Rose chafer.

Macrosiphum—

pisi, see Pea aphid.

solanifolii, see Potato aphid.

Madia, pre-existing species, synthesis of, 485.

Magnesium—

absorption by tobacco, effect of source, Conn.[New Haven] 796.

and calcium studies, Tenn. 342.

balance studies with infants, 596.

excess, harmless for pigs, Wis. 555.

in blood plasma of calves, effect of magnesium salts and various natural feeds, 412.

needs of children, 596.

requirement of chicks, 839.

Magnolia, germination failures, P.R.U. 376.

Maine Station report, 322.

Mal de guaba disease, P.R.U. 220.

Malacosoma americana, see Tent caterpillar, eastern.

Malaria—see also Mosquito(es) and *Anopheles*.

avian, chemotherapy, 419.

in ducks, sulfonamide therapy, 859.

in Mexico, *Anopheles pseudopunctipennis* as vector, 255.

Malayapple for manufacture of wine, P.R.U. 800.

Mammals—see also Animal(s) and *speciosa* kinds.

evolution, and marsupials, 48.

of United States National Museum, type specimens, catalog, 544.

pantothenic acid in blood of, 600.

small, populations, winter reduction and significance, U.S.D.A. 86.

Mammary gland(s)—

biopsy, in connection with mastitis studies, 853.

bovine, nerve supply to, 113.

development with mammogen I in hypophysectomized rat, 265.

effect of lactogenic preparations, 266.

growth in hypophysectomized—

male mice, 654.

male mice receiving oestrogen and prolactin, 266.

rats, failure of steroid hormones to induce, 266.

growth, lobule-alveolar—

effect of progesterone and oestrone administered simultaneously, 845.

in hypophysectomized rats, 655.

system, effect of environmental temperature, 266.

Mammary gland(s)—Continued.

- growth relation to endocrine factors, N.J. 410.
- involution, relation to ovary, hypophysis, and sex hormones, 655.
- lactating, of cow in ketosis, acetone body metabolism, 105.
- of female rats, lactogenic content, effect of stilboestrol, 266.
- of male guinea pig, growth with diethylstilboestrol, 845.
- of rabbit, size, with successive lactations, 266.
- perfused, effect of hormones and drugs, 706.

Man and animals, relation to environment, Me. 303.**Man, growing, metabolism and body weight relation, Mo.** 265.**Man, selenium poisoning of, 98.****Manganese**—

- and growth of lactic acid bacteria, 597.
- availability to poultry, effect of mineral supplements, 274.
- deficiency and accumulation of nitrates in plants, 232.
- deficiency disease of peas, 235.
- in foods and biological material, bibliography, 453.
- requirement of laying hens, 559.
- role in nutrition and bone formation of poultry, [N.Y.]Cornell 99.

Mange, chorioptic, of horse, 851.**Mange, psoroptic, of cow, 851****Mango(es)**—

- rootstocks for, P.R.U. 221.
- tests, Fla. 799.
- varieties, selection, P.R.U. 221.

Mangolds as supplement for pigs, 406.**Mangosteen**—

- seedlings, growth, stimulating effect of brewers' yeast, P.R. 668.
- seeds, structure and development, P.R. 668.
- trees, productivity, P.R. 668.

Manila hemp, see Abacá.**Manometer, injection, assembly for study of reactions at steady state, 169.****Mantids, dipterous parasites of, 255.****Mantis, Carolina, biology, 255.****Manure**—

- as source of potash, Ky. 769.
- dairy barn, storage, treatment, transportation, and distribution, Iowa 277.
- effects on soil, persistence of, N.J. 842.
- efficient use of, patriotic duty and good business, Colo. 774.
- farm, value, Miss. 632.
- liquid, value for pastures, Wash. 610.
- residual effect, Conn.[New Haven] 797.

Maple—

- and oak forest, root distribution and environment in, 352.
- leaf spot, cause, 389.
- sugar, sugar in sap from trees growing in open and in forest stands, Pa. 524.

Maple—Continued.

- sugar, wood, drying rate, effect of relative humidity and air velocity, 526.

Marasmius damage to abacá, control, 233.**Mare(s)**—

- oestrus and ovulation in, 209.
- reproductive performance, seasonal effect, 208.
- survival of spermatozoa in genital tract of, 500.

Marigold(s)—

- rust of English variety, cause, 243.
- tests and varieties, Pa. 803.

Marine muds, *Clostridium kluyveri* isolated from, 349.**Market(s)**—

- New York State regional, economic study, [N.Y.]Cornell 129.
- reports, U.S.D.A. 299, 444, 586.

Marketing, cooperative—

- of truck crops, financial results, P.R.U. 294.
- possibilities and limitations, Calif. 440.

Marsupials and evolution of mammals, 48.**Maryland Station notes, 160, 467.****Maryland University notes, 160, 467.****Massachusetts Station notes, 468, 611.****Massachusetts Station report, 899.****Mastic tree, notes, P.R.U. 465.****Mastitis**—

- and plate count of milk, 106, 847.
- bovine, transmission, 162.
- chronic, feeding as contributory factor in, 715.
- chronic, treatment, 421.
- control, Idaho 703.
- control program for practicing veterinarians, 567.
- control, role of disinfectants in, 715.
- control, udder infusion treatments in herd program, Mich. 853.
- gramicidin in treatment of, 421.
- in dairy herds, development and spread, Wash. 418.
- of dairy cows, N.J. 418.
- prevention and control, Idaho 709, Ind. 709.
- staphylococci, bacteriophages for, isolation and characteristics, 421.
- streptococci, dehydrogenase symptoms of, [N.Y.]Cornell 33.
- streptococci, variability, [N.Y.]Cornell 109.
- studies, Fla. 851.

Materials, essential and strategic, Latin America as source, 584.**May beetle control, Ky. 822.****Meadows, use to hold and enrich soil, U.S.D.A. 793.****Meal cooked in water and in oven of same temperature, comparative cooking time and tenderness, Tex. 899.****Meals**—

- for school, camp, and community, 880.
- thrifty, meat for, U.S.D.A. 881.

- Mealworm larvae**, starving, X-ray studies, 401.
- Mealybug**—
 coconut, effective reduction of population, P.R. 695.
 Comstock, on apples, S.C. 393.
 Comstock, on roots of orchard vegetation, 247.
 Comstock, studies, U.S.D.A. 88.
 pineapple, notable reduction in, P.R. 695.
- Meat**—*see also* Beef, Pork, etc.
 and meat products, nicotinic acid in, 150.
 byproduct(s)—
 competition of new synthetic materials for, 98.
 economic significance, 98.
 possibilities of new developments and utilization, 98.
 utilization, historical review, 98.
 for thrifty meals, U.S.D.A. 881.
 freezing and storage, Iowa 303.
 freezing, relation to palatability, Ill. 588.
 length of freezing period, Wash. 404.
 packing industry, price and production policies, Iowa 283.
 products, starch determination in, 336.
 quality, effect of rate of freezing, 98.
 scraps as protein source for chicks, Miss. 702.
 storage, germicidal lights for, 278.
 stored in community cold storage lockers, thawing and aging, Wash. 404.
- Medicinal plants**, *see* Drug plants.
- Megamelus proserpina**, control with egg-sucking bug, 89.
- Melampsora lint**—
 control by borax, 235.
 pathogenicity in, inheritance, 654.
- Melampsorella**, subtomatal pycnia and witches' brooms, 530.
- Melanophila fulvoguttata**, *see* Hemlock borer.
- Melilotus**, interspecific hybridization in, Iowa 212.
- Melissopus latiscirreanus**, *see* Filbert worm.
- Melolonthine beetles**, West Indian, descriptions and key to larvae, 831.
- Melon**—
 juice, solids in, measurement, 59.
 plants, dichloroethyl ether for protection from wireworms, 252.
- Meningopneumonitis virus** and psittacosis, comparative study, 565.
- Mercury fungicides**, mechanism of action, 380.
- Mermithonema entomophilum** n.g. and n.sp., parasite of *Sepsis cynipsea*, 392.
- Merodon equestris**, hosts of, 247.
- Merton catalog**, list of chromosome numbers, 44.
- Metabolism**—
 and body size, relation, 657.
 basal, of Europeans, effect of tropical environment, 307.
 energy, during gestation, lactation, and postlactation rest, Mo. 103.
 fasting energy, during lactation, Mo. 103.
- Metarionistylum minense**—
 biology, P.R. 255.
 notes, P.R. 695.
 parasite of sugarcane borer in Florida, 95.
- Metals in foods and biological materials**, bibliography of, 453.
- Metaphosphoric acid and proteins**, combination, 166.
- Meteorological**—
 conditions in 1940-41 season in Idaho, Idaho 631.
 observations, 22, 482, Mo. 182.
 report, Wyo. 768.
 services and observations by Florida Station, Fla. 768.
- Meteorology**—*see also* Climate(s), Rainfall, Temperature(s), Weather, etc.
 papers on, 22, 482.
- Methemoglobin**, rate of formation and disappearance following administration of sodium nitrite, 418.
- Methionine**—
 dietary, partial replacement by cystine for purposes of growth, 745.
 methyl group, use in biological synthesis of choline and creatine, 745.
- Methyl bromide fumigation**, 396.
- Mice**—
 field, damage to bulbs, N.J. 391.
 genetic factors affecting lung lobation in, 655.
 growth and lactation, effect of dietary supplements, 744.
 house, insect feeding by, 544.
 imperforate in, inheritance and relation to endocrine function, 498.
 inbred C strain, duplication of seminal vesicles in, 498.
 inbred strains, social behavior, genetic differences, 48.
 male and female, effects of progesterone on, 502.
 orchard, economics and biology, [N.Y.] Cornell 85.
 origin of jerker, a new gene mutation, 48.
 ovaries and embryos in early pregnancy, effect of progesterone on, 501.
 pigment in hair follicle, morphogenesis, 363.
 short-ear gene in, three manifestations of, 48.
 size genes of, 780.
 white belly in, inheritance, 48.
- Michigan College notes**, 611.
- Michigan Station notes**, 611.
- Michigan Station report**, 755.
- Microbial substances**, selective bacteriostatic and bactericidal action, 33.
- Microbracon hebetor**, parasite on tobacco moth larvae, 823.
- Micrococcus piluitoparus**, cause of ropy milk, 847.
- Microhydrogenation apparatus**, simplified, 170.

Micro-organisms—

- action of agents on, 18.
- behavior at subfreezing temperatures, effect of sucrose and pH, 193.
- biochemistry, 349.
- cellulose decomposition, 193.
- cultivation, use of complete fertilizers in, 644.
- disease-producing, effect of microbial antagonists, N.J. 342.
- effect on soil aggregation and erosion, 28.
- growth, relative inhibition by glucose and sucrose sirups, 34.
- in alkali soils, survival, 28.
- in Florida soils, types and distribution, Fla. 768.
- inhibition by toxic substance from aerobic spore-forming bacillus, 348.
- on restaurant glassware, bactericidal effect of ultraviolet rays, 305.
- response to added plant food on major soil types, Ind. 638.
- soil, activity, effect of borax and lime, 29.
- soil, and plants, interaction, 28.
- soil, under Florida conditions, metabolism and functional relations, Fla. 768.

Microphotometer, new, 170.

Microscope slides, pan for washing, 358.

Migration to Arizona—

- volume and characteristics, Ariz. 135.
- volume and characteristics, statistical supplement, U.S.D.A. 877.

Milk—

- and colostrum, examination for *Brucella abortus*, 507.
- and derivatives, nicotinic acid in, chemical determination, 13, 14.
- and products, lecithin content, Ind. 704.
- bacteria count, farm procedures affecting, Mich. 268.
- bacteria, destruction, relation to exposure time and temperature, Ill. 562.
- bacterial counts, roll tube and standard plate methods for making, Wash. 411.
- bottled, deliveries, Vt. 442.
- canned, per capita consumption, Ill. 584.
- carotene in, effect of rotational and continuous grazing by dairy cows, S.C. 411.
- changes in demand in New York metropolitan area, [N.Y.]Cornell 129.
- chocolate-flavored, studies, Mass. 842.
- chocolate, relation to total milk consumption, 416.
- chocolate, tannic substances and theobromine in, significance, 417.
- coagulation, effect of cocoa on, Mass. 842.
- composition, Tenn. 327.
- composition in New Zealand, relation to plane of nutrition, 844.
- computing fat percentage in, N.J. 410.
- constituents, precursors of, Mo. 103.
- consumption—
 - daily, studies, N.J. 434.
 - effects of retail prices and consumers' income, Ill. 584.

Milk—Continued,

- consumption—continued.
 - total, relation to chocolate milk use, 416.
- containers, paper, bacterial population, relation to methods of moisture proofing, N.Y.State 848.
- control administration problems, 583.
- control programs, effect on cooperatives, 582.
- cooling device, Pa. 562.
- cooling survey, 278, 279.
- cost of production, Pa. 584.
- curdling qualities, method of testing, 708.
- distribution—
 - by farmers' cooperative associations, U.S.D.A. 295.
 - reducing delivery truck mileage and costs, 442.
 - single-service containers for, 104.
- drawn aseptically from Utah cows, microflora, 846.
- evaporated—
 - changes in demand in New York metropolitan area, [N.Y.]Cornell 129.
 - curd strength, 709.
 - heat stability, effect of forewarming, 709.
 - properties, N.Y.State 270.
- factor causing let-down of, humoral in nature, 706.
- fair price for, factors in setting, 104.
- fat content, factors in fish oils responsible for depressing, Mo. 103.
- flavor(s)—
 - and milk lipase, 707.
 - effect of inhaled substances, 706.
 - effect of silages fed to cows, Mass. 842.
 - imparted to, by French weed, wild onion, and peppergrass, S.Dak. 563.
 - score, effect of lipolysis, 414.
- formalin adulteration and detection in resulting butter, 849.
- from individual cows, flavor score, effect of rations, Tenn. 411.
- from Vermont plants, elasticity of supply, Vt. 871.
- grading, value of resazurin for, Ill. 562.
- held near freezing temperature, factors involved in spoilage, [N.Y.]Cornell 104.
- homogenization, machines for, comparison of types, Pa. 563.
- homogenized bottled, overcoming seepage, Mich. 268.
- homogenized, fat content, Babcock test v. Mojonnier test for determining, Ariz. 842.
- houses, studies, 278.
- isolation of biotin from, 625.
- lipase and milk flavor, 707.
- lipase inactivation by heat, 414.

Milk—Continued.

- low-priced, and consumption of dairy products among low-income families, U.S.D.A. 591.
- manganese content, effect of level of manganese intake, Mass. 842.
- market, deaeration results, [N.Y.]Cornell 104.
- marketing efficiency in Connecticut, [Conn.]Storrs 872.
- markets in Indiana, economic analysis, Ind. 291.
- markets, regulated, flexible prices for, 104.
- markets, up-State, organization, [N.Y.]Cornell 129.
- New Orleans market for, La. 291.
- of Virginia, *Streptococcus lactis tardus* and *Bacillus albolactis* in, effect on quality, 413.
- oxidized flavor—
 - development and speed of oxidation of ascorbic acid in, 848.
 - development in, factors affecting, Tenn. 411.
 - development, stability of, Fla. 842.
 - in, relation to ascorbic acid and oxygen, Vt. 563.
- pasteurization—
 - bacteriological problems in short-time, high-temperature process, 413.
 - high-temperature short-time v. holder, [N.Y.]Cornell 104.
 - methods and equipment, 104.
 - short-time high-temperature method v. standard holder method, N.J. 410.
- pasteurized, manufacture of American cheese from, 107.
- pasteurizer, Tenn. 428.
- pasteurizers, electric, new developments, 279.
- physical properties, effect on rate of digestion in vivo, Iowa 263.
- physical structure, 106.
- plant operator, problems of, 104.
- powdered, keeping quality, factors affecting, 416.
- price control, future of, 104.
- price determining, 582.
- produced on various rations, potency of grass-juice factor in, N.Mex. 411.
- production—
 - and prices in Springfield-Holyoke-Chicopee milkshed, Mass. 733.
 - and quality, effect of feeding soy-beans and products, Iowa 263.
 - costs and profits per cow, Ill. 584.
 - effect of fineness of grinding grain on, S.Dak. 412.
 - feeding for, Oreg. 842.
 - in New Zealand, relation to plane of nutrition, 844.
 - increase from grain feeding during prelactation period, Wyo. 842.

Milk—Continued.

- production—continued.
 - increasing with thyroprotein, 3.
 - in rat and dairy cow, amounts and energetic efficiencies, Mo. 103.
 - relation to grain feeding, Pa. 842.
 - seasonal costs and returns, [N.Y.]Cornell 130.
- protein stability, test for, 178.
- quality control program of Boston Health Department, 104.
- quality, effect of methods and promptness of cooling, La. 848.
- quality, proposed score grade method of determining, 268.
- rabbit, stimulated by lactogenic hormone, composition, Mo. 103.
- raw and pasteurized counts, effect of handling and aging, 104.
- refrigeration with units driven by gasoline engines and electric motors, Ind. 725.
- retail prices and evaporated milk, price spread between, Ill. 584.
- ropy, organism causing, 847.
- samples failing the methylene blue test, cryophilic bacteria as cause, 847.
- samples, incubated, microscopic examination, 567.
- secretion—
 - effect of fat level and sources in ration, [N.Y.]Cornell 104.
 - energy cost, Mo. 103.
 - in beef cattle, effect of thyroxine, Ind. 655.
 - in cow and goat, effect of fasting and refeeding, Mo. 103.
 - initiation relation to endocrine factors, N.J. 410.
 - treatise, 105.
- sickness caused by white snakeroot, 852.
- skimmed, see Skim milk.
- smothered flavor in, 848.
- solids, dry, baking with, bleaching agents v. potassium bromate in, 338.
- solids-not-fat—
 - and fat in, paying producers for, Wis. 293.
 - content, Ariz. 842, Mo. 103.
- standard plate count, effect of *Streptococcus agalactiae* mastitis, 847.
- stored at low temperatures, effect of rate of cooling on rate of lipolysis, 414.
- superheated soft-curd, 268.
- supply and utilization, Ind. 291.
- supply for New York market, adjusting, [N.Y.]Cornell 129.
- supply, forecasting, Vt. 871.
- vitamin A in, effect of levels of shark-liver oil in ration, Fla. 842.
- vitamin C in, effect of cocoa on, Mass. 842.
- vitamin C in, effect of processing, [N.Y.]Cornell 104.

Milk—Continued.

winter, good flavor and color, feeding methods for, N.J. 410.

yields and milking rates of individual quarters of cow udder, U.S.D.A. 844.

Milking—

by machine put on time schedule, N.Y. State 845.

machines, cleaning, efficiency of methods, Ariz. 842.

plant, "Gascoigne" auto-releaser, 728.

Milkweed(s)—

as source of rubber, Utah, 676.

whorled, toxic to turkey poult, 572.

Mill streams, thiamin in, 148.**Millet**—

pearl, strain tests, Fla. 791.

strain and variety study, [N.Y.]Cornell 53.

variety tests, N.Mex. 366.

Milletia pachycarpa, insecticidal action. Conn.[New Haven] 248.**Millipedes**, relation to potato tuber defects, [N.Y.]Cornell 90.**Milo**—

Atlas and Dwarf Yellow, composition, relation to chinch bug resistance, Okla. 617.

Pythium root rot or "milo disease," 812.

Mineola vaccinii, see Cranberry fruitworm.**Mineral(s)**—

adsorption of barium and hydroxyl ions by, relation to pH, 642.

metabolism studies with artificial radioactive isotopes, 747.

nutrition of plants, Me. 197.

poisonous to livestock, Wyo. 851.

properties, functions in body, and sources, Okla. 749.

Minimum, law of, and Liebig, 616.**Minks**—

digestion of cereal starch and fiber, 407.

nutritive requirements for growth, fur production, and reproduction, [N.Y.] Cornell 85.

Minnesota Station notes, 611.**Minnesota University notes**, 611.**Mint oil**, quality and prices, Ind. 668.**Mirid plant bug**, relation to hay and pasture crop damage, Wis. 546.**Miris dolabratus**, see Plant bug, meadow.**Mississippi Station report**, 159.**Missouri Station report**, 159.**Mites**—

eriphyid, in California, 89.

injurious to domestic animals and man in New York State, 851.

of livestock, N.J. 696.

orchard, sprays for, Wash. 393.

spray mix for, Pa. 546.

Molasses—

cane, as corn substitute in ration of yearling steers, Ill. 554.

cane, in poultry ration, 838.

sugar beet, vitamin deficiencies in, Utah 259.

Molasses—Continued.

use to replace corn in poultry rations, Pa. 554.

Mold(s)—

inhibitors for food products, 741.

mycelia in butter, value of producer interviews in reducing, 107.

new antibacterial agent produced by, 487.

slime, developmental patterns in, 88.

Molecular—

still heads, designs, 474.

weights, determining, Signer method, 171.

Moles, control, Mo. 694.**Molybdenum**—

blue reaction, 173.

in legume nodules, 350.

Monetia sp. in sheep on irrigated pastures, Oreg. 856.**Monetella** mites on cigarette beetle, 823.**Monilia** sp., mode of entrance into corn ears, 383.**Monochamini** in Western Hemisphere, descriptions of new species, 549.**Monocotyledoneae**, form of vascular bundle in, 31.**Monocotyledons**, endodermis of, oxidase system associated with, 31.**Monolepis nuttalliana**, analysis, Ariz. 851.**Monomorium pharaonis**, see Ant, Pharaoh.**Montana College notes**, 611.**Montana Station notes**, 468, 611.**Montmorillonite**, test for, unreliability of benzidine color reaction, 173.**Moose diseases**, studies, 856.**Mortgage loans**, extra-risk, insurance aspects, 583.**Mosquito(es)**—See also *Anopheles*, *Culex*, and *Malaria*.

captive, water-finding and oviposition by, 402.

control, support given to national defense program in, Del. 245.

Culex, vectors of St. Louis encephalitis virus, 711.

emergency research, Iowa 247.

hosts to avian plasmodia, 302.

keg shelter as diurnal resting place, 696.

larvae, behavior, relation to surface tension of water, 96.

mechanical trap for surveys, N.J. 551.

neotropical *Anopheles*, subspecific variations and transmission of malaria by, 696.

of Ethiopian region, 551.

of Missouri, studies, Mo. 85.

studies, U.S.D.A. 89.

survey for vectors of equine encephalomyelitis, 117.

toxicity of aerosols from spraying solutions of insecticides in liquefied gas, 254.

work, outlook for, N.J. 391.

Mountain laurel, propagation, Mass. 800.

- Mourning dove production in southwestern Iowa, 391.
- Mouse embryos, homozygous yellow, development, analysis, 497.
- Mowers, horse-drawn, adapting to tractor power, Mo. 727.
- Muck deposits of New York, properties, [N.Y.]Cornell 23.
- Muck soil, effects of applying common salt on yield, composition, and quality of crops, 189.
- Mud suspensions, biochemical oxygen demand and dissolved oxygen, determination, 179.
- Mudaria variabilis*, life history and control, 402.
- Mule deer, *Oryzobacterium ovis* from, 110.
- Mules—
and horses, situation and future trends, 97.
number on Illinois accounting farms, Ill. 583.
- Mundulea scircea* from India, insecticidal properties, 825.
- Mung bean(s)—
growing, Okla. 664.
hay and silage for milk production, Okla. 704.
production and threshing, 579.
silage, *see* Silage.
- Mu-oil tree, cultural requirements, Fla. 799.
- Musca domestica*, *see* Housefly.
- Muscle degeneration and vitamin E in hamster, 698.
- Muscod fly, new parasitic, from Texas, 255.
- Mushroom(s)—
composts for, Pa. 513.
cultivated, secondary spores in mycelium, 644.
disease control, Mo. 67.
flies and mites, studies, U.S.D.A. 88.
house mold, eradication by spraying, Pa. 528.
insects, biology and control, Pa. 824.
oxidation enzymes, 847.
poisoning by *Lactaria glaucescens*, 349.
- Muskmelon(s)—
breeding and selection, Ariz. 798.
breeding for disease resistance, [N.Y.] Cornell 57.
breeding improved varieties, S.C. 371.
copper dusts for, Mass. 807.
culture, P.R. 668.
disease, rare, 229.
diseases, control, copper dusts for, Del. 227.
effect of various nutrient deficiencies, 238.
Fusarium wilt, relation to potassium and nitrogen supply, 238.
hybrid, new, studies, 59.
lethal virus disease, U.S.D.A. 805.
varieties, quality determination, S.C. 371.
variety tests, Del. 220, Iowa 220.
- Muskrat(s)—
ecology, Iowa 245.
fungus skin disease of, 719.
period of gonadal activity in, 490.
- Mustard culture tests, Wash. 367.
- Mustard variety tests, Wash. 367.
- Mutations—
in fowls, [N.Y.]Cornell 47.
X-ray and ultraviolet induced, in *Neurospora*, 208.
- Mutton types and hybrids, efficiency in meat production, Ill. 496.
- Mycobacterium*—
paratuberculosis, comparative sensitivity of rabbits, guinea pigs, and chickens to, 711.
tuberculosis strains in sputum of persons, 713.
- Mycological nomenclature, 776.
- Mycorrhizas of pine and spruce, 777.
- Mycosphaerella fragariae*, notes, P.R.U. 229.
- Myrmelachista ramulorum* in coffee groves, poison for control, P.R.U. 248.
- Myxobacteria, biology, 34.
- Myxomycetes of Kansas, U.S.D.A. 485.
- Naphthalene—
acetamide, effect on tomato plants, 352.
and orthodichlorobenzene mixture, fumigating action, 547.
- Napier grass—
fertilizer tests, Fla. 791.
for pasture, Fla. 792, 842.
grazed by rotation, composition and grazing value, 257.
grazing tests with beef cattle, Fla. 833.
strain tests, Fla. 791.
- Narcissus—
bulb fly, methyl bromide fumigation for, 830.
bulbs, failure to bloom, causes, N.J. 371.
bulbs, prestorage disinfection of, 82.
diseases, [N.Y.]Cornell 67.
- Nasturtium, stem cuttings, adventitious roots in, 490.
- National defense and rural public assistance, 739.
- Natural resources of Venezuela, 487.
- Nectarine(s)—
bred in New Jersey, 224.
fruiting performance, effect of mild winter in California, 519.
winter chilling requirements and breeding possibilities, 519.
- Nectars of different plants, sugar concentration in, U.S.D.A. 88.
- Nectria*—
cancr f. *aurantii* n.f. on orange trees, 387.
sp. on lemon trees, 387.
- Negro scale, shipment to California, P.R. 695.
- Nematode(s)—*see also* Root knot nematode.
eggs, buoyancy, 392.
eggs in feces, counting, new apparatus for, 392.

Nematode(s)—Continued.

- giant race of, on broad beans, 533.
- hot water forced into soil for control, Ill. 546.
- meadow, studies, S.C. 378.
- parasite of wheworms, 253.

Nematodirus—

- filicollis* in sheep on irrigated pastures, Oreg. 856.
- spp. in sheep, efficiency of phenothiazine against, 423.

Neoplectana chrestima, biology and culture, 392.**Neoplastic—**

- and neoplasticlike diseases, Mass. 858.
- conditions, studies, Ind. 709.
- disease in chickens, 119.

Nephantis serinopa, bethylid parasite of, 403.**Neuroptera—**

- introduction and lists, 90.
- of British Columbia, preliminary list, 90.

Neurospora—

- genetics of biochemical characters in, 208.
- tetrasperma*, induced mutations in, inheritance, 653.

Nevada Station report, 890.**New Jersey Stations reports**, 465.**New Mexico Station report**, 465.**New York Cornell Station notes**, 324.**New York Cornell Station report**, 159.**New York State Station notes**, 324, 611.**Newcastle disease in Victoria**, 571.**Newspapers—**

- American small town weekly, source of research data, 878.
- small-town and cultural change, 588.

Nickel fungicides, mechanism of action, 380.**Nicotinamide in blood, urine, and spinal fluid**, bacterial assay method, 480.**Nicotine—**

- as insect fumigant, 825.
- free, as insecticide in nutrient solutions, Ill. 546.
- sulfate drench, composition, effect of storage, 565.

Nicotinic acid—

- chemical determination, 11, 12, 13, 14.
- determination, microbiological method, 12.
- excretion by pellagrins, 150.
- fate in man and dogs, 601.
- in animal tissues, quantitative estimation, 14.
- in biological materials, cyanogen bromide method of estimating, 480.
- in blood and urine, 893.
- in flour and bread, determination, 622.
- in meat and meat products, 150.
- in rye and its milled products, 146.
- metabolism, effect of sulfapyridine on, 698.

Nigrospora spp., mode of entrance into corn ears, 383.**Nitidulidae in corn**, 247.**Nitrates**, accumulation in plants, relation to manganese deficiency, 232.**Nitrification in—**

Bedford silt loam, effect of potassium chloride, 29.

soils containing plant residues of high lignin content, Mass. 769.

Nitrogen—

and organic matter maintenance under intensive cropping conditions, Conn. [New Haven] 768.

availability studies, Tenn. 342.

calcium, phosphorus, and iron metabolism and requirements of young women, Nebr. 746.

determination, improvement in, Mo. 4.

endogenous, excretion by rats, relation to previous dietary N, 593.

fixation, detection with isotopic nitrogen, 33.

fixing organisms, hydrogenase in, 195.

in soil, effect of cropping and manure treatments, Ky. 769.

in soil, movement, effect of drought and rainfall, Ga. 770.

in soils under different soil treatment, Mo. 22.

retention, effect of calcium and phosphorus retention, 595.

retention, relation to growth and bone development in children, 595.

small quantities, iodometric estimation without distillation, 171.

sources for different vegetables, 221.

studies on Kansas branch experiment stations, 636.

supply and deficiencies of trace elements, Fla. 769.

Nitrogenous—**fertilizers—**

application to Berks silt loam soil, value, Va. 484.

on sandy soils, comparative efficiency and economy, Fla. 768.

rate of nitrification in soils from Salt River Valley, Ariz. 768.

soil and crop interrelations of, Conn. [New Haven] 774.

substitutes for, in orcharding, Mo. 670.

substances, excretion from nodules, 37.

Nodule bacteria—

and host plant, effective and ineffective association, 350.

growth in expressed juices from legume roots, 850.

"Nomersan," tests with seed-borne flax diseases, 74.

Nomophila noctuella, life history and habits, 401.

Nornicotine of Maryland tobacco, U.S.D.A. 5.

North Carolina Station notes, 468.

Nosema disease, studies, U.S.D.A. 88, Wis. 546.

Nostoc commune from 87-year-old herbarium specimen, successful revival, 194.

Nuclei, living, preparation from hen erythrocytes, 720.

Nucleoli and related nuclear structures, 494.

Nursery—

- experimental, management, Ind. 676.
- harvester, inexpensive, practical, 125.
- stock fumigation with methyl bromide, 396.
- stock fumigation with methyl bromide and HCN, Fla. 799.
- stock, growth, factors affecting, Mass. 800.
- stock inspection, 528.
- stock, inspection, certification, and transportation, Ky. 60.
- stock production, Wash. 372.

Nut(s)—

- crop insects, control, Fla. 822.
- for home planting in eastern and southeastern United States, U.S.D.A. 516.
- marketing, bibliography, U.S.D.A. 440.
- trees, varieties, Fla. 799.
- variety tests, Ill. 516.

Nutgrass control methods, Ariz. 791.

Nutrition—see also Diet(s).

- animal, *see* Animal nutrition.
- experiments, use of sulfaguandine in, 310.
- human, in wartime, specific contribution of vegetables and fruits to, 884.
- in defense program, Utah 323.
- in health and disease, 300.
- iodine in, 497.
- plant, *see* Plant nutrition.

Nutritional—

- deficiency and infection, 110.
- deficiency disease, specific, 312.
- science and agricultural policy, 582.
- status, appraisal of, 743.
- status, medical evaluation, 741.

Nygmia phaeorrhoea, *see* Brown-tail moth.

Oak(s)—

- American, anatomical and taxonomic approaches to subgeneric segregation in, 776.
- and maple forest, root distribution and environment in, 352.
- California black, heat injury to leaves, U.S.D.A. 66.
- chestnut, for pulpwood, rapid v. slow growing, Pa. 524.
- chestnut, reproduction, response to clear and partial cutting of overstory, 526.
- fungi causing decay in East, identification, U.S.D.A. 83.
- pin, Fe deficiency in control, N.J. 378.
- rapid growing semievergreen hybrid, propagation, Tex. 804.
- red, complex in United States, 776.
- red, first-year development, effect of pregermination and radicle damage, 526.
- root fungus, effect on avocado, 241.
- rot and cankers, cause, 389.
- Shumard red, northern limits of species, 804.
- southern, wood-decaying fungus of, 390.
- white, volume, growth, and yield studies, 226.

Oak(s)—Continued.

- wilt due to undetermined fungus, Wis. 528.

Oat(s)—

- adaptation to lowland soils and production methods, Mo. 213.
- and corn, comparison as to production, labor, and use, Miss. 795.
- and oat milling products, amino acids in, 138.
- breeding, Fla. 791, Idaho 659, 679, Ill. 504, Ind. 659, Iowa 212, [N.Y.] Cornell 53, Pa. 504, S.Dak. 504, Tenn. 367, Wash. 367.
- coleoptiles, decapitated, growth, auxin, and tropisms in, 779.
- coleoptiles, growth, effect of respiratory stimulants and poisons, 31.
- combining, moisture as factor in, Pa. 504.
- crown rust in Arkansas, overwintering, U.S.D.A. 66.
- disease resistance, breeding for, 684.
- diseases, minor, Iowa 228.
- feeding to growing chickens, 260.
- fertilizer tests, S.C. 367.
- flour, value as antioxidant in milk, Pa. 503.
- growing good crops of, Mo. 54.
- growth and yield, effect of diseases, Idaho 679.
- hay poisoning, antidote for, S.Dak. 564.
- hay poisoning, relation to nitrate reduction, 565.
- hull-less and common, respiratory rates and hygroscopic equilibria, 54.
- inoculations with races and collections of *Ustilago* spp., Wash. 378.
- insects bred from, 394.
- leaf spot control, effect of powder disinfectants, 71.
- manganese deficiency control by spraying, 229.
- manganese deficiency on alkaline organic soils, Mich. 198.
- N carrier rates and K as side dressing for, S.C. 367.
- pasture as supplement in fattening pigs, Fla. 833.
- planting rates, S.C. 367.
- residual effects of cyanamide on, Ind. 659.
- rusts, Iowa 228.
- seed, weak, cause of crop failures, N.Y. State 798.
- seedling growth, effect of red light, 40.
- seedlings after seed exposure to oxygen, growth and metabolism, 31, 647.
- seedling, respiration of parts, effect of acetic acid, 32.
- smut(s)—
 - breeding for resistance to, Mo. 52.
 - control, Miss. 795.
 - resistance in Navarro hybrids, inheritance, 786.

Oat(s)—Continued.

- smut(s)—continued.
 - resistance, studies, 220, 812.
 - studies, Iowa 228.
- sprouted, feeding effect on breeding capacity of dairy bulls, N.J. 360.
- straw as roughage for sheep, limitations of, 556.
- time of planting tests, Mo. 213.
- trace elements in, 52.
- varieties, Mo. 214.
- varieties and hybrids, winter injury, Ark. 664.
- varieties for North Dakota, N.Dak. 55.
- variety tests, Fla. 791, Idaho 659, Ill. 504, Ind. 650, Iowa 212, Mass 793, Mo. 52, Mont. 509, N.Mex. 306, Pa. 504, S.C. 367, S.Dak. 504, Tenn. 367, Wash. 367, Wyo. 793.
- Vicland and other, comparative merits, Wis. 504.

yields, effects of seed treatment, Mo. 67.

Odontotrema, characterization of genus and taxonomic data, 487.

Oedematocera—

- identification of species, 552.
- optata* n.sp., description, 552.

Oenothera, subgenus *Kaimannia*, cytogenetic studies, 31.

Oesophagostomum radiatum in intestines of calves, pathologic changes from, 112.

Oestradiol—

- absorption from subcutaneously implanted tablets in guinea pig, 51.
- morphogenetic actions, effect of testosterone on, 490.

Oestrin injections, effect on mouse ovary, 790.

Oestrogenic hormone in thyroidectomized rats, effect, 789.

Oestrone and stilboestrol, comparative effects on rat pituitary, 655.

Oestrus, prolonged, in rats, effect of luteinizing hormone and antigonadotropic serum 51.

Ohio Station notes, 611.

Oil(s)—see also Fat(s) and specific oils.

- development, effect on population increase and public finance, Okla. 730.
- dormant type, efficiency, relation to composition, 827.
- essential, experimental stills for, P.R. 725.
- lubricating, viscosity after hard use as key to value, Ill. 573.
- producing areas, corporate and personal property, important as sources of revenue in, Okla. 730.
- sprays, selection, Wash. 893.
- substitutes for butterfat in calf rations, 264.
- vegetable, spectral absorption studies, Ind. 616.

Oklahoma College notes, 612.

Oklahoma Station notes, 468, 612.

Old-age assistance in Iowa, Iowa 300.

Oleomargarines, local, chemical studies, P.R.U. 165.

Olive anthracnose in United States, 817.

Onion(s)—

- ascorbic acid in and distribution, 151.
- blight in muck soil, nematocides for, 78.
- breeding, Iowa 220, Mass. 800.
- bulb nematode disease, [N.Y.]Cornell 68.
- bulb rot, cause, 69.
- chemical studies, Mass. 760.
- culture, N.Mex. 371.
- diseases, Iowa 228.
- Ebenezer, effect of storage on carbohydrates, 515.
- high quality, breeding, Ill. 514.
- insects, biology and control, Iowa 247.
- produced for seed, diseases, N.Mex. 378.
- seed production, N.Mex. 371.
- seed, weak, cause of crop failures, N.Y.State 798.
- smut control, [N.Y.]Cornell 68.
- species hybrid, natural amphidiploid from, 45.
- Sweet Spanish, time of most rapid bulb development, Colo. 669.
- thrips control, Fla. 822, Mass. 820.
- thrips, studies, [N.Y.]Cornell 90.
- White Giant, improvement, N.Mex. 371.
- yellow dwarf, Iowa 228.
- yellow dwarf, insect vectors, Iowa 247.

Oocencyrtus anabitorius n.sp., parasite of Mormon cricket, 402.

Oogenesis and fertilization of mice, cytological study, 48.

Oospora pustulans, cause of potato skin spot, 545.

Opeicutelella padutckii n.g. and n.sp., description, 232.

Ophiobolus graminis, survival on grass roots, 382.

Ophthalmia—

- equine periodic, 117.
- periodic, notes, Ky. 851.
- periodic, possible relation to sensitization, 272.

Ophthalmology, vitamin B in, 147.

Opossum(s)—

- ecology, 544.
- inducing ovulation by follicle-stimulating hormone, 490.
- origin of ova in, 658.

Orange(s)—

- juice from oil-sprayed and HCN-fumigated trees, composition, 224.
- mandarin, parasite of, control, 542.
- maturity and quality standards and added color research, Fla. 760.
- moth of Dominica, 551.
- native, improvement, P.R.U. 221.
- navel, quality and yield, factors affecting, Ariz. 798.

Puerto Rican, effect of maturity on juice, acid, and sugars, P.R. 617.

Puerto Rican, wine from juice of, P.R. 617.

satsuma, rootstocks for, Fla. 799.

seasonal average f. o. b. prices, analysis, Calif. 442.

Orange(s)—Continued.

shrinkage and stem-end control, effect of washing, Fla. 760.

subfamily, three new varieties and two new combinations in, 35.

Orchard(s)—*see also* Fruit(s), Apple(s), Peach(es), *etc.*

cover crops, Wash. 372.

covers, relation to soil conservation, N.Y.State 374.

fertilization, Wash. 372.

fertilization, more scientific basis for, 671.

grass, effects of photoperiod, 203.

grass, response to temperature variations, Mo. 53.

insects, control, N.J. 391.

insects in 1941, 547.

irrigation, Wash. 372.

mulches, effect on plant nutrients in soil, Mass. 760, 800.

permanent grass cover for, Mich. 223.

pollination, natural and controlled, [N.Y.]Cornell 61.

sanitation, accessory measures in, Wash. 304.

soil(s)—

arsenic accumulations in, treatment, 161.

available potassium in, [N.Y.]Cornell 373.

management under war emergency, N.Y.State 223.

properties, in eastern Panhandle, W.Va. 484.

toxicity, Wash. 372.

spray machinery for, Miss. 863.

sprays, stickers and spreaders in, N.Y.State 815.

vegetation, Comstock mealybug on roots of, 247.

Orcharding, success in, Mich. 223.

Orchid—

chlorophyll-bearing embryos, delayed photosynthesis in, [N.Y.]Cornell 33.

culture, P.R. 668.

seed studies, [N.Y.]Cornell 33.

Oregon College notes, 468.

Oregon Station notes, 468.

Organic acids—

in plant tissues, modifications in determination, 174.

in plants, Conn.[New Haven] 760.

preserving and germicidal action on yeasts and bacteria, 763.

Organic matter—

and nitrogen maintenance under intensive cropping conditions, Conn.[New Haven] 768.

decomposition, effect of substituted cations in soil complex, 772.

development of simple test for, Wis. 483.

erosion losses of from sandy loam, 638.

in soil—

application of delignifying procedures to, 636.

Organic matter—Continued.

in soil—continued.

maintenance, Wash. 343.

methods for determination, 619.

nature and importance, N.J. 483.

Organoleptic tests, reliability, 18.

Ornamental plants, shrubs, and trees, *see*

Plant(s), Shrub(s), and Tree(s).

Ornithodoros talaje association with bats in human dwellings in Brazil, 403.

Orthodichlorobenzene and naphthalene mixture, fumigating action, 547.

Orthogonal polynomial values extended to $n=104$, tables of, Iowa 898.

Orthoptera of Arizona, Ariz. 827.

Oryzaphilus surinamensis, *see* Grain beetle, saw toothed.

Osmotic pressure of colloidal solutions, measurement, 176.

Ostertagia ostertagi—

in horses, 718.

outbreak and control, Ariz. 850.

Ova and follicle cells from germinal epithelium in ovary, origin, 655.

Ovaries—

and genital tract at and shortly after ovulation, studies, 654.

germinal epithelium proliferation, stimulation by injection of oestrone, 789.

Ovulation—

in anoestrous opossum, inducing, 499.

response in rabbit to plant juice extracts, variations, 654.

Ovulinia cauleae, notes, U.S.D.A. 243.

Oxen work on small farms, cost of, P.R.U. 284.

Oxidation reduction in soils, studies, [N.Y.] Cornell 23.

Orycanus sp., chemical control, 551.

Oxyuriasis studies, 419.

Oysters—

glycogen determination in, 336.

laboratory studies preparatory to formulation of standards, 336.

main source of food, N.J. 392.

Pachysandra stem and stolen canker, N.J. 818.

Packing house research, Fla. 760.

Paeonia californica, distribution of structural hybrids in, 40.

Paint(s)—

house and barn, classification, U.S.D.A. 128.

types for farm structures, N.J. 428.

Painting, spray, for farm buildings, 866.

Paleacrita vernata, *see* Cankerworm, spring.

Paleobotany, 485.

Palm(s)—

anatomical and developmental study, 494.

rattan, growing, P.R. 668.

seeds, handling for shipment, P.R. 668.

Palmetto, cabbage, *Laschia sabalensis* on, 543.

Palpozenillia diatraeae n.sp., new parasite of the sugarcane borer in corn, 402.

Palthis angulatis larvae, new descriptions, 400.

- Pancreas of rat, insulin in, effect of purified pituitary preparations, 362.
- Panicaceae tribe, cytological study of species in, 787.
- Panthea acronyctoides* larvae, new descriptions, 400.
- Pantomorus leuocoloma*, see White-fringed beetle.
- Pantothenic acid—
deficiency studies in dogs, 558.
deficient rats, porphyrin incrustations, relation to water metabolism, 600.
effect on rat dermatitis, Mo. 147.
in blood of mammals, 600.
in feeding stuffs, 257.
in nutrition of rat, 893.
in Royal Jelly, Tex. 899.
in rye and its milled products, 146.
metabolism in man and rabbits, 893.
minimum requirement for pigs, 95, 557.
requirement of chicks, 409.
requirement of mice, 456.
urinary excretion by normal individuals, 456.
- Papaya—
diseases, 82.
papain in, relation of total protein, P.R.U. 229.
Phytophthora parasitica on, 242.
plants, virus infected, chemical relations in, P.R.U. 229.
production in United States, U.S.D.A. 523.
tests, Fla. 799.
virus disease complex in, P.R.U. 229.
- Paper—
and pulp manufacture, microbiological control, advantages, 20.
industry, bacteria in, effect of drier rolls on, 181.
milk containers, bacterial population, relation to methods of moisture proofing, N.Y.State 848.
products, number of bacteria in, effect of mill operations, 181.
- Paprika varieties, N.Mex. 371.
- Papulaspora gladioli* and *Urocystis gladioli*, morphological distinction, 381.
- Paracodrus apterogynus*, parasite of wireworms, 253.
- Paralysis—
Chastek, in foxes, and thiamin deficiency, 858.
Chastek, in foxes fed on fish, 571.
fowl, and allied conditions, etiology, Fla. 851.
fowl and related leukemic diseases, U.S. D.A. 119.
fowl genetic resistance to, [N.Y.]Cornell 47.
fowl, iritis type, transmission, Iowa 270.
fowl, studies, Ind. 709, Mo. 108, Wyo. 851.
range, in poultry, etiology, Iowa 270.
range, resistance to, development in poultry, Ariz. 789.
- Parasites—
employed in biological control, practical application of biological studies, 89.
epiphytes, and geophytes, production of alkaloids and cyanogenetic and organic sulfur compounds, 68.
foreign, introduction, U.S.D.A. 89.
insect, colonization, recovery, and establishment, 89.
laboratory propagation, place in biological control programs, 89.
- Paratetranychus pilosus*, see Red mite, European.
- Parathyroid gland—
and lactation in rat, 705.
of Virginia deer at different seasons, 655.
- Paratrioza cockerelli*, see Potato psyllid and Tomato psyllid.
- Paratuberculosis, see Johne's disease.
- Paratyphoid bacilli, notes, Ky. 851.
- Paris-green-lime mixtures as anopheline larvicides, concentration and distribution, 697.
- Parity price, description and discussion, Okla. 130.
- Parlatoria ohinensis*, studies, U.S.D.A. 88.
- Parmella molliuscula* feeding tests, Wyo. 851.
- Parsley—
carrot weevil as serious pest, biology and control, N.J. 696.
Hamburg, varieties, cultivation, and food value, 589.
- Parsnips, cooking, losses of vitamin C during, 895.
- Parthenocarp, chemically induced in horticultural plants, Mich. 223.
- Partholeskia parkeri* n.g. and n.sp., new parasite of sugarcane borer in corn, 401.
- Paspalum* spp., karology of, 204.
- Passalus cornutus*, see Horned passalus.
- Pasteurization—see also Milk.
and coliform organisms, 107.
- Pasteurizer, experimental laboratory, development and use, Tenn. 411.
- Pasture(s)—see also Grass(es), Grass-land(s), and Meadows.
and Christmas tree plantations, combining on cut-over lands, Mich. 804.
and forage plants, combinations of, variety tests, Ill. 504.
composition of herbage, effect of fertilizer treatments, Me. 264.
contour furrowing for erosion control, Mo. 120.
crop damage, relation to mirid plant bug, Wis. 546.
crops for irrigated areas, Colo. 507.
dairy, returns from various types, Ill. 562.
development, relation to soil and vegetation surveys, Fla. 768.
experimental, measuring nutrients of, Wash. 843.
fertilization, 52, Ill. 482.
fertilization, relation to downward movement of lime and superphosphate, 641.

Pasture(s)—Continued.

- fertilized and unfertilized, carrying capacity for beef cattle, Ky. 834.
- grasses, *see* Grass(es).
- herbage—
 - carotene in, effect of rotational and continuous grazing by dairy cows, S.C. 411.
 - feeding value, variations in, [N.Y.] Cornell 99.
 - fertilized and unfertilized, biological analysis, Fla. 833.
 - in Alabama, composition and yield, effect of lime and fertilizer, 660.
 - production, palatability, and nutritive value, 98.
- improved, by timely mowing for weed control, Miss. 660.
- improvement studies, 98, Iowa 213, La. 411, Mo. 22.
- increasing productivity, Mo. 22.
- Kentucky bluegrass, carrying capacity, effect of grazing management, Iowa 213.
- liquid manure as fertilizer for, Wash. 343, 640.
- mixtures, botanical analysis, inclined point quadrat method, 31.
- mixtures, summer seeding v. spring seeding, Mass. 793.
- mixtures, variety tests, Idaho 659, Wyo. 793.
- native upland, v. irrigated sweetclover, for heifers, Wyo. 842.
- nutritive value to steers, fecal dry matter as index, 258.
- of different kinds, improved, costs, carrying capacity, etc. Idaho 729.
- of South Dakota, carrying capacity, S.Dak. 554.
- of southeastern Ohio, effect of locust and walnut trees, 661.
- permanent, establishment, Fla. 792.
- permanent, fertilization, Ind. 659.
- permanent, soil erosion on, Vt. 638.
- plants and mixtures, Ind. 659.
- plants, palatability, 52.
- productive value, measuring, Mo. 732.
- receiving different treatments, use by beef cattle, S.C. 403.
- replacing redtop with Kentucky bluegrass as dominant growth, Wis. 504.
- returns as pounds of milk, effects of fertilizer treatments, Me. 264.
- seeding mixtures and techniques, [N.Y.] Cornell 53.
- sheep, cleansing of helminths by cattle, 569.
- soil moisture supply on, effect of lime, N.J. 342.
- species, productiveness, effect of soil fertility, Mass. 793.
- studies, 258, Fla. 792, Ill. 504, Mo. 53, Wyo. 793.
- steep, renovation, Wis. 504.
- use to hold and enrich soil, U.S.D.A. 793.

Pasture(s)—Continued.

- vegetation, type and amount, relation to dispersion ratio, 660.
- white clover, management and returns on, Mich. 264.
- yields, measuring, clipping and grazing methods, Wash. 411.
- Pea(s)—
 - Alaska, weak seed cause of crop failures, N.Y.State 798.
 - aphid control—
 - improved, Wis. 546.
 - rotenone-bearing spray for, Ill. 546.
 - studies, 829, Me. 248.
 - use of dusting machines in, 399.
 - with rotenone-bearing dusts, effect of temperature and wind, 398.
 - canning, effect of borax, Wis. 513.
 - canning, fertilization, Wis. 513.
 - canning varieties of Wisconsin, tests, Wis. 801.
 - culture tests, Fla. 799.
 - diseases in Palouse section of Idaho, U.S.D.A. 66.
 - effects of boron on, Del. 212.
 - for quick freezing, best program for growing, N.J. 434.
 - frozen pack, vitamin C in, Wash. 447.
 - inoculated, effect on time of maturity, N.Y.State 222.
 - market garden, frost tolerance of strains, 59.
 - marsh spot, a manganese deficiency disease, 235.
 - marsh spot, varietal susceptibility, 383.
 - meal in poultry rations, Wash. 404.
 - nodulation, effect of seed treatment, 666.
 - preserved by frozen-pack method, ascorbic acid in, Wash. 458.
 - protein of, value, Idaho 739.
 - reduced germination in, N.Y.State 222.
 - response to auxin, effect of low intensity orange light on, 32.
 - root rot, fungi causing, N.Y.State 815.
 - seed, bacteria causing poor germination, Idaho 679.
 - seed, chemically treated, and inoculation, 539.
 - seed, responses to treatment, N.Y.State 222.
 - split seeds in, 512.
 - varieties, English, yields, Miss. 59.
 - varieties for canning, Wis. 513.
 - variety tests, Fla. 799, Wash. 367, Wyo. 793.
 - weevil control, reduced rotenone poundage possible, Idaho 694.
 - weevil, studies, U.S.D.A. 88.
 - wilts and root rots, Wis. 235.
 - yield, effect of fertilizer placement, S.C. 371.
- Peach(es)—
 - acidity and tannin in, relation to dietary value, N.J. 371.
 - aphid feeding on snapdragon, injury from, 94.

Peach(es)—Continued.

aphid, green, overwintering on Brassicae in North Wales, 93.
 arsenical injury on, crystalline v. monohydrated zinc sulfate for prevention, 541.
 bacterial spot, culture, Del. 227.
 breeding, Ill. 516, Iowa 220.
 brown rot control, 816, N.J. 541.
 buds, opening, effects of growth substances, 62.
 canning tests, S.C. 338.
 carotenoid in, effect of processing, 455.
 cherry yellows, indexing, 691.
 Chinese, seedlings, testing, Ill. 516.
 constriction disease pathogen, ascogenous stage, 240.
 deficiency symptoms, 80.
 developed by the station, N.J. 371.
 diseases in North Carolina, U.S.D.A. 66.
 diseases in Ozark section of Arkansas, U.S.D.A. 66.
 dormant sprays on, 547.
 effect of low winter temperatures, Ill. 516.
 following total crop failure, infested with plum curculio, 247.
 fruit thinning, Ill. 516.
 fruiting performance, effect of mild winter in California, 519.
 genetic composition, Mass. 800.
 golden net virus disease, Colo. 691.
 leaf curl, dinitro sprays for, Del. 227.
 little leaf disease, Fla. 799.
 little peach disease, Del. 227, 816.
 mosaic control and eradication, U.S.D.A. 66.
 mosaic virus incubation period, 240.
 nematode-resistant, Shallit variety, propagation problems, 240.
 new commercial, bred and tested in New Jersey, 224.
 orchards, lespedeza as cover crop for, Ill. 516.
 orchards, production costs, Ill. 584.
 orchards, soil management, Ind. 668, Ky. 799, Pa. 513.
 phony disease—
 control and eradication, U.S.D.A. 66.
 in Oklahoma, U.S.D.A. 66.
 vectors, collection, U.S.D.A. 88.
 production and preservation, Wash. 62.
 rosette mosaic in the East, 81.
 scale, white, on papaya, predator of, P.R. 695.
Sclerotinia fructicola cankers on, [N.Y.] Cornell 68.
 self-fruitfulness, Del. 220.
 split-pit of and time of occurrence, 519.
 spray injury on, Del. 227.
 spraying requirements for plum curculio on, 393.
 stocks, nematode resistance in, N.J. 371.
 thinning, effects, Miss. 671.

Peach(es)—Continued.

trees, arsenic toxicity to, Idaho 679.
 trees, handling after fruit-bud winter killing, Mo. 375.
 trees, longevity in Georgia, Ga. 375.
 trees, potassium requirements, Pa. 513.
 varieties, comparative hardiness, N.J. 371.
 variety tests, Ind. 668, N.J. 371.
 wart disease, Idaho 679.
 winter chilling requirements and breeding possibilities, 519.
 X-disease—
 absence from State, Del. 227.
 chemotherapeutic tests with, Conn. [New Haven] 805.
 prevalence, Wash. 378.
 review of present knowledge, 541.
 studies, Colo. 691, [N.Y.] Cornell 68, U.S.D.A. 88.
 western, in Oregon, U.S.D.A. 377.
 western, in Utah, 387.
 western, virus-induced, Idaho 679.
 yellow freestone, adaptability for canning, Wash. 451.
 yellow-red virosis, see Peach X-disease.
 yellows, studies, Del. 227, 816.
 Peachtree borer—
 control, 547, Ill. 540.
 control, ethylene dichloride emulsion for, Del. 245, Mass. 800, U.S.D.A. 88.
 ethylene dichloride and paradichlorobenzene crystals for, N.J. 391.
 treatments, injury from, 247.
 Peanut(s)—
 as feed for swine, deficiencies, Fla. 833.
 breeding, Fla. 791.
 Cercospora leaf spot control, 67, Fla. 806.
 culture tests, Fla. 792.
 diseases in Georgian S. S. R., 529.
 diseases in North Carolina, U.S.D.A. 66.
 growing to meet war needs, Miss. 660.
 hay for fattening steers, Fla. 833.
 increased acreage asked to meet war needs, Miss. 213.
 inoculation methods, Fla. 792.
 leaf spot control, Va. 534.
 leaf spot control in Brazil, 534.
 meal for dairy cattle, 410.
 meal in swine ration, Ga. 836.
 production—
 for oil in national defense program, 510.
 for war needs, Ga. 132.
 machinery in, 124.
 notes, Miss. 370.
 ring spot, symptoms, 235.
 runner, and corn, rotating with native cover crops, Fla. 792.
 Spanish, increased yields by dusting, Ga. 235.
 Stegasta bosqueella, micro leaf worm on, 247.
 variety tests, Fla. 791.
 verruccosis, 235.

Pear(s)—

- Anjou, cock spot of, Wash. 378.
- Bartlett, auction prices, relation to supplies, Calif. 442.
- Bartlett, black end of, Wash. 378.
- Bartlett, market quality, relation to ripening temperature, 518.
- breeding, Iowa 220.
- buds, opening, effects of growth substances, 62.
- fire blight, Idaho 679.
- fire blight-resistant, development, Tenn. 371.
- fire blight, varietal susceptibility to, S.Dak. 528.
- irrigation experiments, Calif. 518.
- pollen, useful abnormality of, 672.
- practices to induce early and regular bearing, [N.Y.] Cornell 61.
- psylla—
 - control program, 395, 824.
 - in Northwest, U.S.D.A. 88.
 - survey, Wash. 394.
- refrigerated gas storage, 673.
- respiration, relation to ethylene production, 355.
- spray injury, 528.
- storage, 802.
- tree insects in central Washington, 394.
- vitamin C in, Wash. 447.

Pearl, R., contributions to poultry science, 259.

Peat—

- deposits of Louisiana, La. 633.
- deposits of New York, properties, [N.Y.] Cornell 23.
- moss as soil amendment for roses, 226.

Pecan(s)—

- climatic requirements in Yuma Valley, Ariz. 798.
- groves, cooperative fertilizer tests in, Fla. 799.
- grown under irrigation, food value, N. Mex. 327.
- growth and production, relation to nitrogen absorption and storage, Fla. 799.
- harvesting dates, Ariz. 799.
- nuts, filling, factors in, Ariz. 799.
- orchards, cover crop tests in, Fla. 799.
- rosette in mature trees, zinc sulfate treatments for, 817.
- trees, delayed foliation in Arizona, 675.
- Ariz. 799.
- trees, top-worked, care of, Miss. 675.
- trees, top-working methods, Ariz. 799.
- trees, unfruitful or inferior, effect of top-working, Miss. 221.
- varieties, Fla. 799, N.Mex. 371.
- winter dormancy, relation to sunshine, Ariz. 799.

Pectin—

- compositions, public service patent on, Del. 165.
- decomposition, role of intestinal bacteria in, 141.
- demethylation, effect on jellying properties, Del. 17.

Pectin—Continued.

- ingested, fate of, 142.
- ingested, metabolism of, 504.
- partial demethylation, Del. 165.

Pectinophora gossypiella, see Bollworm, pink.

Pellagra, excretion of nicotinic acid in, 150.

Pemphres affinis parasites in India, biology and distribution, 400.

Penicillin—

- and gramicidin, comparative bacteriostatic activity, 33.
- antibacterial action, 33.

Penicillium, mode of entrance into corn ears, 383.

Pennsylvania Station report, 609.

Penny cress seed germination, 512.

Pentilia castanea, scale predator, notes, P.R. 695.

Peony(ies)—

- anthracnose in Illinois, U.S.D.A. 680.
- bud blast, N.J. 818.
- measles, control program, 244.
- testing for heat resistance and use as cut flowers, Iowa 220.

Pepper(s)—

- breeding, Conn.[New Haven] 790.
- chile, as sources of carotene and ascorbic acid, N.Mex. 446.
- diseases in North Carolina, U.S.D.A. 66.
- flower bud moth, studies, P.R.U. 248.
- mosaic-resistant, P.R.U. 229.
- mosaic studies, P.R.U. 386.
- mulching, Mass. 800.
- Perfection pimiento, fruit growth, 60.
- pimiento, mosaic-type virus disease of, control, P.R.U. 815.
- rot due to *Botrytis* with sclerotial stage, 539.
- Rutgers World Beater No. 13, value, N.J. 371.
- weevil, Fla. 822.
- yield, effect of methods of growing and transplanting, 59.

Peppergrass, perennial, root system, 31.

Peppermint—

- anthracnose control, Ind. 679.
- new disease in Indiana, Ind. 679.
- oil, yield and market value, factors affecting, Ind. 180.

Peregrinus maidis—

- in New Jersey, 93.
- notes, P.R.U. 394.
- transmission of wallaby ear disease of corn by, 812.

Peridermium strobi, see White pine blister rust.

Peridental tissues, effect of prolonged vitamin deficiencies, 598.

Perilla culture tests, Ill. 504.

Perilla variety tests, Ill. 504.

Periplaneta americana, see Cockroach, American.

Pertisera nepentidis, life history, distribution, and economic importance, 408.

Periwinkle—

- false blossom cure by heat, 244.
- infected with aster yellows, heat cure, 83.

- Peronospora* spp. spore dispersal, mechanism, 536.
- Perosis in chicks—**
control, 560.
relation to blotin, Mo. 830.
sunlight as preventive, Wis. 555.
- Peroxidase in different tissues of citrus fruits,** 490.
- Persimmon—**
brownish sooty mold, 242.
native, data, U.S.D.A. 675.
polyploidy in, 45.
- Pest control, patents relating to, U.S.D.A. 87.**
- Petri dish—**
cover, new, and technic for use in cultivation of anaerobes and microaerophiles, 485.
holder for mechanical stages, 495.
- Petroleum oils as insecticides, dormant type, efficiency, relation to composition, 827.**
- Petunia—**
dodder on, U.S.D.A. 805.
leaf curl, new strain, 76.
pollen, X-ray treatment of, cytological irregularities induced by, 46.
- Phacidium nigrum* on *Xolisma ferruginea*, 381.
- Phaeosaccardinula javanica* n.comb. on persimmon, 242.
- Pheasant(s)—**
aberrant plumage colors in, [N.Y.] Cornell 47.
fall feeds, Pa. 546.
management, Iowa 245.
- Phenols—**
bactericidal activities, effect of temperature, 486.
in vanilla extract, determination and significance, 337.
- Phenothiazine—**
as anthelmintic, 852.
as anthelmintic for horses, 117, 857.
as anthelmintic for large animals, 271.
as anthelmintic for sheep, 116.
failure as anthelmintic in Oregon sheep, 116.
incorporated in sheep feed or lick, possible anthelmintic value, 856.
poisoning in pigs, 274.
- Phenylacetic acid, effect on tomato plants,** 352.
- Philaenus spumarius*, notes, Del. 245.
- Phloem necrosis, virus disease of American elm, U.S.D.A. 692.**
- Phlox powdery mildew—**
notes, Mass. 807.
resistance, 388.
- Phlyctocytrium uppsii* n.sp., notes, 381.
- Phomopsis—**
citri and *Diplodia natalensis* as cause of citrus disease, comparative behavior, 542.
juniperovora blight of white cedars, 229.
sp. collected on citrus plants in Brazil, 542.
vesans, perfect stage of, 538.
- Phoradon humuli*, see Hop aphid.
- Phosphatase—**
activity, comparative, of skim milk, whole milk, cream, and butter, Iowa 263.
excretion, fecal, and calcium and nitrogen balance of rats, 453.
reaction of butter, effect of storage conditions, Ind. 704.
test, extent of use in North America, 707.
- Phosphate(s)—**
adsorbed, from kaollinite by fluoride, replacement, 29.
bond energy, metabolic generation and utilization, 471.
effect on hardness of soil, 189.
- fertilizers—**
comparison, Iowa 183.
effectiveness, field tests, Ky. 345.
field test of, Pa. 641.
problem of, Ill. 640.
fixation in New Jersey soils, variation in, N.J. 342.
in Iowa soils, determination, Mitscherlich method for, 618.
method of application, N.J. 342.
rock, reaction with P_2O_5 , 30.
value as plant food source, Miss. 632.
- Phosphate-lime studies, Tenn. 312.**
- Phosphorus—**
and calcium retention, effect of nitrogen retention, 595.
and calcium studies in normal adults, 451.
calcium, iron, and nitrogen metabolism and requirements of young women, Nebr. 746.
ceruleomolybdate determination, 618.
compounds in Kentucky soils, Ky. 769.
fertilizers, new, Tenn. 343.
fixation, effect of soil temperature, 641.
lays, low and high, nutrition studies with rats and calves, Tenn. 404.
in biological materials, determination, 332.
in lamb and steer rations, Idaho 697.
in soils, determination, provision for eliminating interference of arsenic, 478.
in soils, forms, and availability to plants, Iowa 183.
organic, in soils, extraction and separation, 174.
organic, in soils, nature and decomposition in soil cultures, 188.
organic, v. superphosphate in plant nutrition, 641.
retention, relation to growth and bone development in children, 595.
roughages, high and low, for steers, Tenn. 404.
sources, effect on cigar-leaf tobacco, Conn. [New Haven] 796.
turn-over of rat skeleton on normal and rachitogenic diets, effect of pregnancy, 311.
- Photoperiodic aftereffect, 784.**

Photosynthesis—

and absorption in blue radiation, 649.
bacterial, and importance for general problem, 471.

CO₂ evolution during induction period, 649.

CO₂ exchange and measurement of quantum yield, 42.

chemical energy of, 42.

depressant effect of carbon dioxide, 202.

facts and interpretations, 471.

fundamental investigations, results, 485.

inhibitory effects of inorganic compounds, 493.

of greenhouse roses, effect of sprays, Ohio 203.

quantum efficiency of, 485.

rate in legumes supplied with free or bound nitrogen, 784.

studies, Ind. 616.

use of radioactive CO₂ in, 485.

o-Phthalaldehyde solution as glycine reagent, preparation, 179.

Phycomyces—

guanline and factor Z₁ as growth substances for, 194.

hypoxanthine as growth substance for, 645.

Phyllachora cynodontis, new fungus on *Muhlenbergia schreberi*, U.S.D.A. 377.

Phyllanthus nummulariaefolius in United States, 348.

Phyllobius spp. on cultivated fruit trees in Great Britain, 400.

Phyllocoptes oleivorus, see Citrus rust mite.

Phyllophaga—

distribution, descriptions, and records, 549.

inopia n.sp., description, 549.

sylovatica n.sp., description, 549.

Phyllosticta n.spp. on western Gramineae, 72.

Phymatotrichum—

omnivorum, utilization of inorganic nitrogen by, 234.

root rot, new host plants subject to, U.S.D.A. 680.

root rot of pecan trees, control, Ariz. 805.

Physaloepera—

rhodina, life history and taxonomy, Fla. 808.

zeicola, notes, 234.

Physcus testaceus, introduction into California, 821.

Physiographic correlations, Ariz. 859.

Physoderma zeae-maydis, notes, 234.

Phytic acid and the preparation of food, 594.

Phytohormones, control of flowering with, 770.

Phytomonas—

alliiicola n.sp., description, 69.

caryophylli n.sp., description, 68.

corylina, notes, 242.

genus, lipolytic activity, 809.

incanae n.sp., description, Calif. 692.

manihotus, description, 69.

Phytomonas—Continued.

manihotus, nomenclature, classification, and physiology, [N.Y.]Cornell 67.

matthiolae, notes, 244.

n.spp., nomenclature, classification, and physiology, [N.Y.]Cornell 67.

solanacearum, notes, N.J. 877.

spp. infecting tobacco leaves, relation to moisture, 383.

spp., notes, Pa. 686.

tumefaciens, notes, 689.

viburni, notes, U.S.D.A. 805.

Phytophaga destructor, see Hessian fly.

Phytophthora—

citrophthora on citrus, 81.

crown rot of loquat, 387.

fruit rot of tomato, 229.

infestans, see Potato blight, late.

lateralis n.s.p., studies, 381.

parasitica on papaya, 242.

spp. on avocado and walnut, 242.

spp., oospore formation in paired cultures, 81.

Pickles—

and the national diet, 887.

quality, production, disease control program for, 18.

sweet, bloater formation in, 19.

Pickleworm control, S.C. 393.

Pig(s)—see also Sows and Swine.

breeding Landrace-Duroc and Chester

White and their crosses, Ind. 655.

breeding stock evaluation, Iowa 209.

brooders, Wash. 428.

charcoal in rations for, value, [N.Y.]Cornell 99.

crossbred and purebred, relative mortality, S.C. 403.

crossbreeding in, value, Ill. 788.

crosses, differences between, Iowa 209.

cut-out profit or loss on, Iowa 283.

development, effect of sex, 209, 210, 657.

disease of sucklings, Ill. 564.

Duroc, weight and market score, heritability of differences in, 209.

early spring farrowed, use of electric heat in brooding, Ind. 725.

embryo, double notochord in, 655.

fattening—

and growing rations, calcium and phosphorus relations, 98.

comparison of ground and whole

Sooner mlo with corn for, S.Dak. 554.

economy of gains made by, factors affecting, S.C. 403.

Mississippi-grown feeds for, Miss. 836.

rations for, Fla. 834.

feeding experiments in Irish Free State, 259.

feeding, protein supplements for, Calif. 407.

feeding zinc to, 856.

growing-fattening, protein needs of, Ill. 554.

Fig(s).—Continued.

- hemophilia-like conditions in, inheritance, 861.
- improved strains for American conditions, value of Danish Landrace breed in, Iowa 209.
- improving native stock in Puerto Rico, P.R.U. 407.
- inbred lines, experimental design for testing, 209.
- inbred lines, trends in, 209.
- incubated eggs for and feeding methods, 101.
- Large White breed, longevity and interval between generations, 210.
- market—
 - cause for losses and shrinkage, Ind. 698.
 - crossbreeds for production, S.C. 404.
 - feed requirements, tentative standard, 701.
 - feeding and management, Wis 259.
 - grades, feed requirements, Fla 833.
 - rations for, Mo. 99.
 - types and grades, Ind. 698.
- nutrition, role of fat in, Ind. 697.
- nutritional deficiencies of concentrate mixture, 98, 557.
- of Iowa, factors affecting grade, Iowa 283.
- on alfalfa pasture, proso, corn, and barley as feeds for, N.Dak. 836.
- pantothenic acid for, minimum requirement, 557.
- peanuts as feed, deficiencies of, Fla. 833.
- phenothiazine poisoning, 274.
- Poland China—
 - effect of inbreeding, Iowa 209.
 - heritability of conformation, 656.
 - large and small type sexual development, 209.
- prices and corn prices and expectations, Iowa 283.
- production in Florida, Fla. 102.
- progeny testing shows differences in dressing percentage, Idaho 697.
- protein supplements for after weaning, S.Dak. 554.
- proteins and vitamin supplements v minerals for, [N.Y.] Cornell 99.
- purebred, breeding and rearing, 496.
- raising, free from worm parasites, effectiveness of method, 423.
- reduction of mortality in, N.J. 360.
- reproduction and lactation, effect of simplified diet, 98.
- selenium poisoning in, effect of arsenic, 424.
- shelled corn and barley for, Tenn. 404.
- shipped to Omaha market, marketing cost, Nebr. 441.
- soybean oil meal and pasture with corn for, Mich. 836.
- spleen, embryonic, grafts of, reactions of omentum of albino rat to, 655.

Pig(s).—Continued.

- sunshine and minerals for, Wis. 555.
- thiamin requirements, relation to fat in diet, 98.
- unbred virgin gilts, low Bang's agglutination test reactions in, Mo. 108.
- wartime rations for, 406.
- weaning, rations for, Mo. 99.
- Pigeon(s)—
 - and rats, relation of protein and purine metabolism in, 698.
 - autosexing in, 657.
 - efficiency for utilization of feed in squab production, N.J. 403.
 - pox vaccine, use of, N.J. 427.
 - production of squabs at normal rate, length of time of, N.J. 360.
 - treatise, 562.
 - vitamin requirements, Mo. 410.
- Pigeonpeas, strain tests, Fla. 791.
- Pigments, bacterial, method for measuring, 193.
- Plimontos, *see* Pepper(s).
- Pine(s)—*see also* White pine.
 - bark beetles, control, U.S.D.A. 88.
 - beetle, mountain, native predators, external sex characters, 95.
 - blister rust, *see* White pine blister rust.
 - jack, logging costs in clear-cutting v partial cutting, 679.
 - jack, spherical gall rust, 390.
 - Japanese black, successful exotic on North Atlantic coast, 674.
 - loblolly, nursery stock, effect of soil treatments, 678.
 - loblolly, one parent heredity tests with, 525.
 - longleaf, 40-yr. old plantation, measurements, 678.
 - Mugho Swiss, propagation, Mass. 800.
 - oil emulsions, disinfecting value, 396.
 - oleoresin, l-pimaric acid in, determination, improved methods, 477.
 - plantation thinning at Baltimore, N. C., results, 524.
 - ponderosa, reproduction at low elevations in Sierra Nevada region, 525.
 - red and white, plantings, survey of vigor of, Wis. 524.
 - red, growth, effect of mineral fertilizers, peat, and compost, 525.
 - red, needle blight and late fall browning, cause, 245.
 - red, transplants, rabbit damage, Mich. 246.
 - reproduction, effect of *Cylindrocoproturacatoni*, 253.
 - Scotch, naturalization in Oneida County, New York, 678.
 - seedlings, survival and growth, effect of planting methods, 677.
 - shoot moth, European, Conn.[New Haven] 822.
 - shortleaf, planting on adverse sites, fertilizer tests, 677.

Pine(s)—Continued.

- shortleaf, seedlings, for transplanting, effect of length of time of root exposure, 526.
- southern, polyembryony in seeds, 678.
- spittle bug studies, 398.
- stands, second-growth, profitability of forest management in, Calif. 65.
- thinning experiments, crop tree measurements in, 524.
- trees, *Ips* bark beetle attack on, 832.
- Virginia, direct seedling on abandoned fields, Pa. 524.

Pineapple(s)—

- flowering control with phytohormones, 779.
- fruits, rotting and exudation of gum in, insect injury causing, P.R.U. 248.
- gumming disease, physiology, P.R.U. 229.
- insect pests, geographical distribution, 251.
- mealybug wilt, geographical distribution, 251.
- nitrogen nutrition, relation to nitrate and carbohydrate reserves, 355.
- waxing to improve shipping quality, P.R.U. 221.

Pingue, grazing with sheep, N.Mex. 403.

Pifion nuts grown under irrigation, food value, N.Mex. 327.

Pinus radiata, zinc requirement, 679.

Plophilus casei, see Cheese skipper.

Pirkularia oryzae in Arkansas, U.S.D.A. 377.

Pissodes strobi, see White pine weevil.

Pistache, dichogamy and pollination in, 676.

Pistol casebearer control with insecticides, 395.

Pitanga mineral deficiencies, Fla. 806.

Pituitary (ies)—

anterior—

- effect on blood sugar in chicks, 790.
- growth hormone, effect on pigs, 502.
- in guinea pig, autoplasmic ocular grafts, 655.
- injections, effect on fat percentage and fat yield of dairy cows, 105.
- of female rat, mitotic activity, 658.
- of fowl, cytology, 50.
- of fowl, gonad-stimulating activity relation to reproductive condition, 502.
- thyrotropic hormone of, effect on growth rate and organ hypertrophy, 52.
- fowl, biological assays for gonadotropic potency, 502.
- glands, horse, and pregnant mares' serum, gonadotropin in, comparison, 50.
- gonadotropins, duality, 501.
- growth hormone and thyrotropic hormone, synergism between, 834.
- growth hormone, bio-assay, 655.
- lactogenic hormone of, 106, Mo. 103.
- of Equidae, crystalloids in, 655.

Pituitary (ies)—Continued.

- of gonadectomized rats, prevention of castration changes as action of steroid hormones, 655.
- of rats, lactogenic content, effect of stilboestrol, 266.
- rabbit, changes in hormone content after mating, 501.
- Placenta effect on corpus luteum of pregnancy in mice, 52.
- Plagiognathus albatrus*, control, 397.
- Plankton—
 - as source of food, 485.
 - wartime use of, proposals, 776.
- Plant(s)—see also Flora and Vegetation.
 - adequate oxygen supply for, importance, N.J. 371.
 - and animals, diploid cell and diploidisation process in, criticism and rebuttal, 495.
 - and soil micro-organisms, interaction, 28.
 - and soil relations, Fla. 700.
 - annual, of California desert, dependence on shrubs, 353.
 - annual, testing for heat resistance and use as cut flowers, Iowa 220.
 - as ground covers for Florida gardens, Fla. 372.
 - autopolyploid, chlorophyll content, 41.
 - auxin determination in, 351.
 - breeders, problem of developing varieties for freezing preservation, 373.
 - breeding programs, effect on plant disease problems, 527.
 - British, list of chromosome numbers, 44.
 - bug injury to tomatoes, Ind. 604.
 - bug, meadow, effect on bluegrass seed setting, Ky. 822.
 - bugs, larger, Fla. 822.
 - calciphilic and calciphobic, intake of elements by, 27.
 - carbohydrates, origin and transformation, 783.
 - cation absorption mechanism, 645.
 - cell(s)—
 - enlarging, relative osmotic value, 782.
 - length in relation to stem length, developmental analysis, 494.
 - metabolism, 201.
 - wall, chemistry, 42.
 - walls, crossed fibrillar structure, 42.
 - chromosomes, see Chromosome(s).
 - coloring matters of, 4.
 - common, correct scientific names, determination, Ariz. 776.
 - composition as index of soil fertility, 772.
 - composition, effect of fertilizers and soil type, Wash. 343.
 - composition, effect of soil conditions, Iowa 183.
 - constituents, chemistry of, 37.
 - culture in water vapor to facilitate examination of roots, 651.
 - culture, soilless, in greenhouse, N.J. 371.
 - cuttings, use of root-promoting substances with, N.J. 371.

Plant(s)—Continued.

cytology, section-smear method for, 628.
 development on soils of Everglades, role of special elements in, Fla. 760.
 dicots and monocots, calcium-boron metabolism, 197.
 disease(s)—*see also* Fungi and different host plants.
 and insect pests, strategy of attack, 527.
 and wet weather in New Hampshire, U.S.D.A. 680.
 control, 805.
 control for New Mexico, N.Mex. 248.
 control in home garden, Mo. 815.
 host-parasite check-list revision, U.S.D.A. 66, 377, 527, 680, 681, 805.
 in Kansas, U.S.D.A. 527.
 in Montana, U.S.D.A. 377.
 in North Carolina, U.S.D.A. 66.
 in Pennsylvania, U.S.D.A. 680.
 nursery stock, for prevention of soil erosion, Iowa 228.
 prevention and control, P.R.U. 800.
 relation to climate, 527.
 reported in Texas since 1933, U.S.D.A. 680.
 Reporter, index to supplements 121-128, U.S.D.A. 805.
 Reporter, index to supplements 130-132, U.S.D.A. 681.
 Reporter Index, Vol. XXV, U.S.D.A. 67.
 resistance and xeromorphy, 31.
 role of insects in spread, 229.
 survey, Wash. 378.
 Survey, Canadian, report, 807.
 survey, findings in, Iowa 228.
 virus, of potato group, Wash. 378.
 distribution and ecology in waterfowl breeding areas, Iowa 191.
 drug, *see* Drug plants.
 edible wild, available in Alabama, Ala. 589.
 effect of soil air, Miss. 27.
 effect of various growth substances, 38.
 examination for insecticidal constituents, 825.
 extracts, spectroscopic analysis for chlorophylls a and b, 333.
 flowering—
 and ferns of Arizona, U.S.D.A. 347.
 and nonflowering, mineral pattern, 32.
 interspecific hybridization in, endosperm as barrier, 46.
 winter lighting, Wash. 428.
 for soil conservation purposes, adaptation studies, Iowa 191.
 greenhouse, diseases, Wash. 378.
 greenhouse, method of watering, [N.Y.] Cornell 64.
 groups, boron distribution among, 354.
 growing in containers, distribution of moisture for, 27.

Plant(s)—Continued.

growing, limitations of auto-irrigators for controlling soil moisture under, 781.
 growing season, average, and departures therefrom, Mich. 766.
 growing under different light conditions, development, effect of mineral nutrition, 783.
 growth—
 and development, effect of photoperiodic induction with constant and intermittent light, 357.
 and development, symposium, 38.
 effect of arsenious, arsenic, and antimony oxides, Mass. 769.
 effect of fluorescein on, 780.
 effect of waste sulfate liquor, 347.
 habit, effect of light, 40.
 hormones, extraction, 38.
 limitation by magnesium and minor element deficiencies, differences in, 108.
 of leaves and stems, tomato test for factors limiting, 32.
 patterns in, 38.
 relation to pH value, 771.
 reproduction, and composition, effect of mineral elements, Fla. 760.
 growth substances—
 and growth curvatures, 38.
 for seed treatment of sugar beets, Mich. 194.
 injections in rats and chick embryos, 655.
 newer applications of, 347.
 synthetic, effect on cuttings and seeds, 221.
 hardy perennials, blooming dates, Mass. 803.
 hedge, for northern Great Plains, U.S.D.A. 676.
 herbaceous, high-phosphate starter solutions for, [N.Y.] Cornell 64.
 hormones, *see* Plant growth substances.
 hunters in Andes, 347.
 insecticidal and piscicidal, of India, 86.
 intake of elements applied to soil in pairs v. singly, Mass. 800.
 invertase action in, alterations of prevailing direction, 489.
 juice extracts, ovulation response in rabbit, 654.
 juices, sex maturity factor in, 654.
 living, enzymic processes in, 471.
 macroscopic photoperiodic aftereffects in, 80.
 magnesium requirements, Mass. 800.
 manganese deficiency in, relation to accumulation of nitrates, 282.
 material(s)—
 ascorbic acid in, photometric determination, 15.
 ashing conditions, relation to mineral elements in ash, 838.

Plant(s)—Continued.

material(s)—continued.

- analysis, rapid chemical methods, 174.
- decomposition, Iowa 183.
- extraction of carotene from, 763.
- herbaceous, variety tests, Mass. 800.
- introduced for testing, U.S.D.A. 484.
- new introduction and distribution, P.R. 668.
- sodium determination in, 333.
- metabolism, boron and calcium in, relation, N.J. 371.
- mineral nutrition of, Me. 197.
- mineral requirements, indicated by solution cultures, 616.
- minor growth substances in, effect of vernalization and photoperiodism, 780.
- mitotic periodicity in and respiration, correlation, 31.
- monocots, types of vessels in various organs of, 651.
- monocotyledonous, endodermis development, relation to an oxidase system, 205.
- nitrate and ammonium nitrogen absorption and use by, effect of oxygen supply, N.J. 342.
- nitrate nitrogen utilization by, relation to phosphorus supply, N.J. 342.
- nutrient substrates for, significance of oxygen in, 492.
- nutrients, erosion losses of from sandy loam, 638.
- nutrition—
 - and adsorbed ions on colloidal complex, 772.
 - and pH, 186.
 - and physiology under artificial light supplementing daylight, Ind. 649.
 - efficiency of organic phosphorus v. superphosphate in, 641.
 - fresh water phytoplankton for, 485.
 - from commercial viewpoint, 196.
 - importance of sodium for, 29, 642.
 - intensity of, and yields, 26.
 - iron and manganese in, relation, N.J. 371.
 - organic, 485.
 - relation to minor elements, 491.
 - relation to soil reaction, Ariz. 768.
 - role of major and minor nutrients and accessory substances, 196.
 - soil factor in, 196.
 - surface relations of roots and colloidal clay in, 32.
- of New Mexico, 32.
- of New Zealand, 36.
- of ornamental value for Rio Grande Valley, Tex. 376.
- organs, localized injury from hydrogen fluoride and other acid gases, 230.
- ornamental—
 - as carriers of virus diseases to truck crops, 238.
 - cultural requirements, N.J. 371.

Plant(s)—Continued.

ornamental—continued.

- cuttings, use of growth substances on, Pa. 513.
- diseases, U.S.D.A. 805.
- diseases due to soil-infesting organisms, control, Mass. 807.
- diseases, identification and control, Iowa 228.
- diseases in greenhouse, [N.Y.] Cornell 67.
- in Pennsylvania, diseases, U.S.D.A. 680.
- new, testing, S.Dak. 513.
- of Florida, rooting media, 225.
- perennial, for eastern Washington, Wash. 372.
- tests, Fla. 709.
- parasites new to Arizona, Ariz. 805.
- passage of air through, relation to measurement of respiration and assimilation, 402.
- pasture, growth, relation to development and deterioration of roots, Fla. 701.
- pathogens, aerial dissemination, 68.
- pathogens, bacterial, relation to coliform bacteria, 228.
- pathological research in Bombay, 528.
- pathology progress report for 1939-40, 807.
- perennial ornamental, effect of blizzard of 1940 in Iowa, 707.
- photography, 205.
- photoperiodic reaction, inhibitory effect of leaves, 41.
- photosynthesis, *see* Photosynthesis.
- photooxidation processes in, 202.
- physiology, new fields for work in, 781.
- poisonous—
 - known and unknown, toxicity studies, 851.
 - of South Dakota, 417.
 - range, analysis, Ariz. 857.
 - to livestock in Florida, Fla. 851.
- potted, watering, use of wicks for, [N.Y.] Cornell 64.
- products for insecticidal properties, survey, 87.
- propagation, growth substances in, nature and use, Colo. 801.
- quarantine system, foreign, of Australia, 229.
- resources of Colombia, 487.
- root system, method for study, 205.
- roots, moisture supply near, measurement, N.J. 342.
- rubber-producing native, Utah 676.
- sap, bound water in, effects of temperature and nutrition, 165.
- sap, liquid extraction method for determination, 783.
- science(s)—
 - formulae, 191.
 - history of, 80.
 - institutions and organizations in Central and South America, 609.

Plant(s)—Continued.

science(s)—continued.

research institutions and personnel in Central and South America, editorial, 325.

scientists in Central and South America, 609.

seed, shoot apex in, structure, 43.

small, culture in sunlight under controlled temperature conditions, 649.

species, differentiation, role of isolation in, 776.

succession on land in continuous alfalfa culture, effect of fertilizers, U.S.D.A. 485.

tissue(s)—

and slides, washing devices for, 358
carotene in, determination, developments in methods, 7.

cultures, 196.

cultures, new field of work in plant physiology, 781.

excised, evidence concerning cell secretion, root-pressure, and gas diffusion in, 490.

improved paraffin schedules for, 628.
isolation of unsaponifiable constituents, 169.

living, production of artificial frost injury, apparatus for, 67.

method of determining when killed by extremes of temperature, 513.

organic acids in, effects of pretreatment on estimation, 331.

organic acids in, modifications in determination, 174.

post-mortem darkening, relation to respiration, 355.

succinic acid as metabolite in, 168.
torsions in, analysis, 786.

toxicity and accumulation of chloride and sulfate salts in, 190.

translocation of solutes in, [N.Y.]Cornell 33.

virus activity problem, physicochemical viewpoints, 69.

virus diseases, distribution in Philippines, 69.

viruses, serological studies, 530.

viruses, ultrafiltration studies, 69.

vitamins in, effect of cultural treatment, Mo. 145.

water absorption by, effect of composition of soil atmosphere, 32.

with small chromosomes, schedule used for somatic counts, 358.

woody, *see* Woody.

zinc deficient, vacuoles in cells of, catechol aggregates in, 809.

Plantain, English, cytological-histological study, 785.

Plasma proteins, properties and functions, 141.

Plasmodiophorales, host index, bibliography, and description of diseases caused by this order, 808.

Plasmodium—

catemerium, 3H2 strain in canaries, course of infections, 724.

gallinaceum, continued passage of extra-erythrocytic forms, 119.

gallinaceum, mosquito hosts to, 392.

lophurae in ducks, host-parasite relation of untreated infections, 859.

Plastic wastes as fertilizers, value, N.J. 342.

Platygodidae, food plant relations in Hawaii, 546.

Pleospora herbarum from red clover seed, 683.

Plesiocoris rugicollis, control on apples, damage from, 396.

Pliofilm wrappers for Florida fruits and vegetables, Fla. 372.

Plodia interpunctella, *see* Indian-meal moth.

Plow(s)—

adjustment and operation, Mo. 727.

draft increase due to parasitical friction, Pa. 573.

fertilizer attachment for, Ind. 725.

trash shields, studies, Ind. 725.

Plum(s)—

aphid control with dinitroresol, 396.
breeding, Iowa 220.

curculio—

control, Tenn. 393.

control, dichloroethyl ether for, U.S.D.A. 88.

in apples, control, Mass. 820.

jarring for control, Ill. 546.

on peach following total crop failure, 247.

on peaches, spraying requirements, 393.

diseases in Ozark section of Arkansas, U.S.D.A. 66.

effect of low winter temperatures, Ill. 516.

golden net virus disease, Colo. 691.

growth, Iowa 220.

mature, framework grafting, 670.

thinning, effects, 671.

variety tests, Ind. 668.

wild, brown rot, U.S.D.A. 805.

Plywood use in hog and poultry houses, structural and economic factors, Ind. 725.

Pneumococci, sulfonamidefast, response to penicillin, 710.

Pneumoenteritis of calves, filtrable virus from, 115.

Pneumonia—

in food-producing animals, pathology of, 712.

of calves, filtrable virus from, 568.

of calves, sulfapyridine in treatment, 115.

Poinsettia—

diseases, new, in Gulf coast area, 245.

scab, Fla. 806.

scab in Honolulu, 244.

Poison dusts, daytime use, Miss. 695.

Poison mixtures, toxicity tests, analysis, 825.

Poison-ivy control with ammonium sulfamate spray, Wis. 505.

Poisonous plants, *see* Cattle poisoning,
Plants, poisonous, and specific plants.

Poliomyelitis—

- insects and epidemiology, 395.
- relation to housefly control, 553.
- rodent, 567.
- virus from flies, 553.

Pollen—

- chemical analyses and feeding experiments with bees, U.S.D.A. 88.
- growth studies, 195.
- reserves of bees, U.S.D.A. 88.
- tube culture, 780.

Polychrosis viteana, *see* Grape berry moth.

Polymbryony in *Asparagus officinalis*, cytogenetic studies, 31.

Polygonatum, cytological basis for speciation in systematic study, 32.

Polyploidy—

- induction in *Vinca rosea*, 31.
- studies with wheat, Mo. 52.

Polyporaceae of Pennsylvania, Pa. 644.

Polyporus—

- betulinus*, life cycle, 31.
- spp. on sprout oak stands, U.S.D.A. 84.
- schweinitzii* red-brown butt rot on western hemlock, 543.
- sulphureus* brown cubical rot on western hemlock, 543.

Polysaccharides, plant, structure of, 783.

Polystictus abietinus pitted sap rot on western hemlock, 543.

Poncirus trifoliata disinfection of seed and roots, 529.

Pond, small artificial, income possibilities from, 545.

Ponds and lakes, uses and management, N.Dak. 820.

Popcorn breeding Ind. 659.

Popcorn variety tests, Ind. 659.

Popillius disjunctus, *see* Horned passalus.

Popillia japonica, *see* Japanese beetle.

Poplar, yellow, plantings on adverse sites, fertilizer tests, 677.

Poppy—

- bacterial soft rot, causal organism, 83.
- California, nomenclature, Ariz. 776.
- diseases in Oregon, U.S.D.A. 805.

Population—

- change, geography of, in Canandaigua Lake region, New York, 586.
- changes in New York and significance for local government, [N.Y.]Cornell 445.
- farm, of North Dakota, papers on, N.Dak. 877.
- growth in Kentucky, Ky. 587.
- movement, back to country, Pa. 586.
- movement, effect of soil fertility, Ill. 587.
- movement into nonagricultural industries as defense-boom workers, 737.
- of Kentucky, growth, 1880-1940, Ky. 877.
- redistribution in Louisiana, 877.

Portia—

- colorea* n.sp. spongy butt rot on western hemlock, 543.

Portia—Continued.

- genus, index and key to species, Pa. 644.
- spiculosa* n.sp. in Hickory and oak, 389.
- spp. on sprout oak stands, U.S.D.A. 84.
- subacida* feather rot on western hemlock, 543.

Pork—

- changes during freezing and storage, Ind. 697.
- diet, pregnancy disorder induced by, modifications in blood, urine, and tissues of rats on, Iowa 303.
- diets, toxemic pregnancies induced by, production and cure, Iowa 303.
- effect of temperature on grades held in storage, Iowa 257.
- flavor, effect of fish meal and fish oil, Ind. 697.
- frozen, palatability, cooking losses, and tenderness, Ind. 740.
- muscle, autoclaved, biological value, Iowa 303.
- nicotinic acid in, 150.
- production, emergency, Mo. 406.
- products, oat flour as preservative for fat in, Ill. 554.
- quality, effect of hominy feed on, Ind. 697.
- quality, produced on pasture, S.Dak. 554.
- quality, role of fat in, Ind. 697.

Porphyria incrustations in pantothenic acid-deficient rats, relation to water metabolism, 600.

Porthetria dispar, *see* Gypsy moth.

Potash—

- and lime studies, Tenn. 342.
- in fertilizers, determination, effect of temperature of alcohol, 174.
- residual value, Ill. 482.

Potassium—

- availability in orchard soils, [N.Y.]Cornell 373.
- availability in soil types, Iowa 183.
- determination by cobaltinitrite method, effect of temperature and pH. 477.
- determination with dipicrylamine, 477.
- dichromate, selective bacteriostatic effect of, 192.
- dipicrylamine, photometric determination, 172.
- exchangeable, in Alabama soils, relation to needs of cotton, 345.
- fertilizer, most economical form, Miss. 189.
- in biological materials, determination, 172.
- in bone and tooth substance, spectrochemical studies, 462.
- in fruit products, determination, 337.

Potato(es)—

- aphid injury, varietal susceptibility, 251.
- aphids, studies, U.S.D.A. 88.
- bacterial brown rot control, Fla. 806.
- bacterial ring rot, classification and nomenclature of pathogen, 383.

Potato(es)—Continued.

- bacterial ring rot—continued.
 control, 535, Me. 228, W.Va. 236.
 identification, Wis. 528.
 in Arizona, Ariz. 805, U.S.D.A. 805.
 in late crop seed, 75.
 prevention of spread on cutting
 knife and early symptoms, Idaho
 679.
 bags, washing and sterilizing, N.Dak. 686.
 baked, scoring for texture, 139.
 blackening on boiling, cause, 448.
 blackleg control, 236.
 blight, epiphytotic of in Argentina, 534
 blight, late—
 control in an epidemic year, 534.
 first report in Colorado, U.S.D.A. 66.
 in New York, U.S.D.A. 805.
 reports, U.S.D.A. 680.
 spraying for, Me. 228.
 studies, U.S.D.A. 805.
 blight-resistant varieties, new, 534.
 Bliss Triumph, Dakota seed of, treat-
 ment, Fla. 791.
 borax studies with, Mass., 793.
 breeding, Idaho 659, Ind. 659, Iowa 212,
 [N.Y.]Cornell 53, Wash. 367, Wyo. 793.
 certification work with, Wyo. 793.
 Cobblers, ethylene chlorohydrin treat-
 ment, Me. 228.
 composition and nutritive value, Mass.
 605.
 cooked, blackening, properties of pig-
 ment, 887.
 cover crops, rotation, and soil reaction
 tests, [N.Y.]Cornell 53.
 crop and wireworms, 253.
 Cu-lime dust effective on, N.J. 378.
 cull grades of, causes for, Idaho 729.
 culture in Iowa, Iowa 217.
 culture tests, Fla. 792, Idaho 659, Tenu.
 367, Wyo. 793.
 deep scab studies, Wis. 528.
 degeneration in São Paulo, virus Y one of
 chief causes, 535.
 diseases—
 control, Fla. 806, Mont. 812.
 in Idaho, 74.
 in Iowa, 228.
 in Massachusetts, U.S.D.A. 805.
 in North Carolina, U.S.D.A. 66.
 losses caused in Hastings Section,
 Florida, U.S.D.A. 680.
 spray tests for, Me. 228.
 virus, Wash. 878.
 virus, studies with tuber-line seed
 plats and insects, Me. 685.
 dried, ascorbic acid in, 751.
 early, experiments on sandy loam, Ohio
 510.
 enterprise in Garrett County, Md. 132.
 fall-crop Irish, production, Okla. 665,
 666.
 feeding to growing chickens, 260.
 fertilizer tests, Fla. 791, Idaho 659, Me.
 213, Mo. 53, N.J. 366, [N.Y.]Cornell
 53, Tenn. 367, Wyo. 793.

Potato(es)—Continued.

- fertilizer-cover crop experiments and
 nutritional sprays, Fla. 791.
 flea beetle—
 biology and control, Wash. 394.
 on cigar-type tobacco in South,
 U.S.D.A. 394.
 studies, Conn.[New Haven] 822,
 U.S.D.A. 88.
 western, studies, U.S.D.A. 88.
 flower and berry production, relation to
 photoperiod and supplemental light
 intensity, 204.
 foundation seed, roguing service for pro-
 ducers, Me. 213.
Fusarium wilt, extensive occurrence,
 Idaho 679.
 grade, storage, and cooking quality
 studies, Idaho 659.
 green manure tests, Me. 213.
 Green Mountain tuber-line seed plats, re-
 lation to viroses, Me. 228.
 green-sprouting treatment, Mo. 53.
 improvement by food-for-freedom pro-
 gram, Colo. 665.
 insects, 248, N.Dak. 248.
 insects on Long Island, [N.Y.]Cornell 90.
 insects, survey, Iowa 247.
 iron in, effect of cooking method, 886.
 irrigation, value in New Jersey, N.J. 428.
 irrigation with cold well and warmer
 canal waters, Idaho 724.
 jell end rot, effect of moisture supply,
 Idaho 679.
 Kansas, market preferences and quality
 analysis, Kans. 298.
 late-crop, retail trade practices and pref-
 erences in Chicago, U.S.D.A. 299.
 leaf extract and entire leaf as index of
 soil fertility, 783.
 leaf roll, varietal susceptibility and effect
 on yield, 534.
 leaf roll virosis, tests for resistance to,
 Me. 228.
 leafhopper, hibernation, N.Dak. 248.
 leafhopper on peanuts, control, Va. 534.
 manganese-deficiency disease on burned
 peat soil, Wis. 528.
 marketing by Ohio Farm Bureau Co-
 operative, U.S.D.A. 440.
 mechanized production, Idaho 725.
 methods of ensiling, Idaho 703.
 Netted Gem, cooking quality, effect of ir-
 rigation, Wash. 447.
 new chlorinated lime treatment for,
 N.Dak. 75.
 new form of low-temperature injury in,
 812.
 new, handling and shipping tests, Calif.
 580.
 new wild species from Argentina and
 Uruguay, 487.
 plants, effects of insect attacks, [N.Y.]
 Cornell 90.
 pollen, germination, simple method for,
 191.

Potato(es)—Continued.

- prices received by growers and handlers, [N.Y.]Cornell 129.
- psyllid, immature stages, effect of insecticides, 250.
- psyllid studies, N.Mex. 303, U.S.D.A. 88.
- rate and course of respiration in, [N.Y.] Cornell 33.
- research, Idaho 664.
- Rhizoctonia* disease, Fla. 806.
- ring rot, U.S.D.A. 527.
- ring rot and zero tolerance in seed, Colo. 686.
- root knot nematode, Nev. 236.
- root nematode larvae, determination of death in, 535.
- rot due to *Xylaria apiculata*, Fla. 806.
- rotation studies, [N.Y.]Cornell 90.
- Russet Burbank, vitamin B complex factors in, Idaho, 739.
- scab *Actinomyces* in aerial parts, staining, 236.
- scab, replies to questionnaire on and summary of survey, 685.
- scab, rotation for, [N.Y.]Cornell 67.
- scab types and control in muck soils, Ind. 679.
- seed, fungicidal and ethylene chlorohydrin treatments, Fla. 806.
- seed, handling and storage, Fla. 792, [N.Y.]Cornell 53.
- seed pieces exposed to hot dry conditions, decay in, Idaho 679.
- seed, production in Ireland and aphid population, 399.
- seed sources and planting distances, N.Mex. 366.
- seed stock diseases, causal agents and control, Iowa 228.
- seed stocks, increasing on isolated farm, Me. 213.
- seed treatment and irrigation tests, N.Mex. 366.
- seed, treatment, strength of mercuric chloride solutions for, Me. 236.
- seed treatments, S.C. 378.
- seed treatments, effect on germination, disease control, and yield, N.Mex. 378.
- seed tuber multiplication fields, virus diseases in, identification, 75.
- seedlings, virus resistance tests, Idaho 679.
- silage, *see* Silage.
- skin spot, cause, 535.
- soils, available calcium and pH relations in Aroostook Co., Me. 183.
- sold in retail stores, analysis of inspections, [N.Y.]Cornell 129.
- source of seed v. disease incidence, S.C. 378.
- spraying and dusting efficiency, [N.Y.] Cornell 67.
- spraying and dusting practices, [N.Y.] Cornell 90.
- spraying experiments, Mass. 820.

Potato(es)—Continued.

- starch grain structure, alteration, effect of disease, 685.
- starch grains structure and staining, 358.
- stem-end browning and net necrosis, Me. 228.
- stem-end rot caused by *Rhizoctonia solani*, 685.
- strain tests, Fla. 791.
- tuber(s)—
 - composition and culinary quality, [N.Y.]Cornell 53.
 - during storage, nonosmotic force in water relations, 781.
 - growth, measuring with new device, Idaho 659.
 - hastening maturity by killing vines with chemical sprays, Idaho 659.
 - "healed holes" condition of suspected insect origin, Fla. 806.
 - showing net necrosis, seed value, N.J. 366.
 - sprouting and sugar in, effect of vapor of methyl ester of a naphthaleneacetic acid, 645.
 - tissues, diffusion pressure deficit, 48.
 - unusual spotting, cause, 75.
- vapo dusting, Fla. 806.
- varieties—
 - and wireworm injury, N.Dak. 696.
 - Chippewa and Katahdin seed tubers, effect of low-temperature injury on value, Me. 228.
 - cooking quality tests, Wis. 505.
 - Peruvian, sanitary state, 235.
 - rate of nutrient absorption by, 217.
 - sugar-forming characteristics in cold storage, and suitability for potato chips, 589.
 - tests of certified seed, Wis. 505.
- variety-spacing tests, Me. 213.
- variety tests, Fla. 791, Idaho 659, Ind. 659, Iowa 212, Mass. 793, N.J. 366, N.Mex. 366, [N.Y.]Cornell 53, Tenn. 367, Wash. 367, Wyo. 793.
- vegetative growth and tuber yield, effect of flowering and fruiting, Minn. 604.
- violet root rot of, U.S.D.A. 377.
- virus diseases, [N.Y.]Cornell 68.
- virus diseases in New Hampshire, increase of, U.S.D.A. 680.
- virus diseases, role of aphids in, Me. 248.
- virus Y transmission by *Aphis rhamni*, 829.
- vitamin C in, storage and cooking losses, Wyo. 880.
- vitamin C in, studies, 459.
- wart, world distribution, biology, and control, 236.
- washed, effect of heat-drying on periderm, 358.
- wireworm, injury, crop rotations for, N. Dak. 95.
- yellow dwarf, [N.Y.]Cornell 67.
- yellow dwarf resistance of Sebago variety, Wis. 528.

Potato(es)—Continued.

- yellow dwarf virus, weed suspects of, 75.
- yields, Me. 213.
- yields, effect of virus diseases, [N.Y.]Cornell 67.

Poultry—see also Chick(s), Chicken(s), Ducks, Fowl(s), Hens, etc.

- action of toxins of strains of *Clostridium botulinum*, type E, on, 720
- adult mortality in individual cages, reducing, effectiveness of progeny testing for, N.J. 360.
- air-conditioning, 278.
- and egg farms, one-man, causes of failure, N.J. 434.
- artificial insemination in, Tenn. 360.
- autopsies, analysis, 571.
- Barred Plymouth Rock, breeding for combination of meat and egg production in, Mass. 789.
- blood, methods of obtaining for cell volume determination, 274.
- blue comb or "X" disease, isolation of filtrable virus from, 720.
- breeding and production experiments, Del. 260.
- breeding, calcareous mineral supplements for, Fla. 833.
- breeding, high and low egg producing strains, Ariz. 788.
- breeds and varieties, standard, U.S.D.A. 408.
- brooding, fundamental requirements, 278.
- Brown Leghorn, effect of thyroidectomy on feather pattern, 655.
- calcification in, interference of heated diets with, 202.
- calcium requirements, 408.
- carcass, changes in, after slaughtering, Iowa 257.
- costs and profits, Ill. 869.
- crop impaction in, method for relief, Miss. 840.
- delousing leg band for, 93.
- diseases—
 - bibliography of, 118.
 - diagnoses, Idaho 709.
 - genetic resistance to, [N.Y.]Cornell 47.
 - nutritional, 571.
 - research, inheritance as factor in, 118.
 - respiratory, increase in, Ill. 564.
 - spontaneous neoplastic, survey and study, Mass. 721.
 - studies, 425, Mass. 858.
- dressed—
 - cooling with refrigerated brine sprays, 703.
 - factors affecting temperature changes during refrigeration, Mo. 141.
 - wet cooling, Wash. 428.
 - wet v. dry cooling, 278.
- effect of inbreeding and crossbreeding, Iowa 209.
- effect of liberal use of oats, Idaho 697.

Poultry—Continued.

- egg size, physiology of, 364.
- farms, efficiency of natural disinfectants, Wash. 418.
- feather weight, effect of castration on, 790.
- feeding and confinement rearing experiments, Ariz. 701.
- feeding and management, N.Mex. 102.
- feeding experiments, Ariz. 102.
- feeding, wartime, 837, N.Dak. 702.
- feeding with corn cockle, effect, 276.
- feeds, constituents, 558.
- fertility, effect of low temperatures, [N.Y.]Cornell 47.
- flock mortality, Mass. 858.
- freezing and storage, Iowa 303.
- genetic studies, Mass. 788, Wyo. 788.
- green range to replace feed scarcity due to war, Colo. 838.
- growth and feathering, effect of age, Iowa 257.
- growth and feathering, factors in oats affecting, Iowa 257.
- growth and reproduction in, additional nutritive factors essential for, 163.
- hemoglobin concentration, effect of phenothiazine on, 719.
- hexamitiasis in, 426.
- house air cooling, 282.
- house blackout, effect on poultry lighting schedules, 278.
- house floor for layers of wire supported by peeled pine poles, Miss. 128.
- houses for laying hens, Okla. 127.
- housing studies, Ind. 725, Mass. 860, Mo. 120.
- immunization, pox vaccine for, N.J. 418.
- improvement, P.R.U. 408.
- inbred lines, homozygosis of, Iowa 209.
- Japanese Bantams and creepers, 789.
- keeping, profitable, 260.
- laying house, earth stabilized with emulsified asphalt for, suitability, Ind. 725.
- laying house, time- and labor-saving equipment for, Ohio 581.
- Leghorn, breeding for viability, Ind. 656.
- lice and mites, control, Mo. 393.
- lice control, Ky. 822.
- lighting studies, 103.
- losses great despite disease-control progress, Ill. 564.
- market, gains and quality relation to fattening period and ration, Iowa 257.
- marketing, cooperative, in Kansas, Kans. 295.
- meat, relation to grain varieties, S.Dak. 554.
- methods of feeding protein supplements to, Ky. 834.
- molt and housing experiments, Ariz. 102.
- molt behavior and fecundity, physiological relations, Mass. 789.

Poultry—Continued.

- mortality, causes of, N.Dak. 719.
- mortality, reduction by selective breeding, Idaho 709.
- normal growth, Mo. 99.
- nutrition and feed law enforcement, 100.
- nutrition in wartime, research in, 102.
- nutrition, vitamins essential in, 834.
- palatability studies, Iowa 303.
- parasite-free, production of, 859.
- parasites, phenothiazine and related products in removal and control, Wash. 418.
- pituitaries, unfractionated extracts, comparative gonadotropic potency, 364.
- plants, effect of egg quality preservation devices on, N.J. 403.
- Plymouth Rock, market type, production by breeding, Ind. 656.
- production, economics of, Ind. 729.
- products, cost of production, reducing, Mo. 733.
- products research, guide for research workers, Iowa 837.
- protein concentrates in diets for, percentage utilization and supplementary relations, 837.
- rations, Wis. 555.
- rations, cane molasses as constituent, 838.
- rations, emergency, N.J. 408.
- rations for growth and egg production, Mo. 99.
- rations high in vitamin E, compounding, Iowa 257.
- rations, molasses as corn substitute in, Pa. 554.
- regenerating feathers, source of melanophores in, 654.
- respiratory diseases, 275.
- respiratory nervous disorder, filtrable virus as cause, 722.
- Rhode Island Red—
 - and Orpington color, genetic studies, Mass. 788.
 - breeding for reducing mortality in, Mass. 788.
 - rapid and slow feathering in, Mass. 788.
- role of manganese in nutrition and bone formation, [N.Y.]Cornell 99.
- roup and colds in, prevention, Miss. 275.
- science and practice, treatise, 102.
- science, contributions of Raymond Pearl to, 259.
- semen production of White Leghorn high- and low-producing strains, 364.
- sexual behavior, effect of sex hormones on, 655.
- sod disease, diagnosis, Fla. 851.
- stored dressed, bile depletion method to eliminate liver strain in, 703.
- tapeworm, removal by short periods of starvation, 571.
- ventilation problem, 127.
- vitamin D of shark-liver oil for, Fla. 833.

Poultry—Continued.

- vitamin needs, 261.
- wastes, recovery of valuable byproducts, Iowa 165.
- water warming for, 278.
- wet wings, new disease, diagnosis, Fla. 851.
- White Leghorn, dubbing, directions, Hawaii 701.
- White Leghorn, selection for body size, N.J. 360.
- winter lighting, Wash. 428.
- Poverty, rural, effect of Farm Security Administration on, 739.
- Powder-post beetles, control, U.S.D.A. 88.
- Powdery mildews, stimulatory and toxic effects of copper sprays, 531.
- Power developments on ranch and farm, design, construction, and installation, Mont. 431.
- Power used on Pennsylvania farms, U.S.D.A. 207.
- Prairie(s)—
 - of Louisiana, isolated, 32.
 - soil as medium for tree growth, 65.
 - soils, black, chemical composition of clay fractions, 184.
 - soils, role of soil bacteria as direct factor in aggregation of, 773.
- Precipitation—*see also* Rainfall, Snow, *etc.*
 - and temperature conditions in Dominican Republic, 182.
 - hourly, on Upper Ohio and Susquehanna Drainage Basin, U.S.D.A. 768.
 - in Muskingum River Basin, U.S.D.A. 340.
 - percentage, seasonal, maps of, 631.
- Pregnancy in mare, chemical test for, Mo. 47.
- Pregnant mare serum, response of hypophysectomized male guinea pigs to, 654.
- Preservative liquids in sealed vials, adding or changing without removing cork, 90.
- Pressure cooker—
 - gages, reliability, Wyo. 880.
 - steam, studies, 898.
- Prices—
 - and currency depreciation, [N.Y.]Cornell 130.
 - and price indexes, tables, Okla. 435.
 - effects of exchange depreciation, [N.Y.]Cornell 876.
- Privet, *Cercospora* leaf spot of, 229.
- Prodenia eridania*, *see* Armyworm, southern.
- Production, effects of exchange depreciation, [N.Y.]Cornell 876.
- Progesterone—
 - administration to mouse, maintenance of deciduomata in, 654.
 - effect on male and female mice, 502.
 - effect on uterus of mice, 654.
 - metabolism, 789.
- Propaganda, sociological analysis, 879.
- Propylene glycol, continued administration, results, 451.
- Proso, turkey-ing-off, S.Dak. 703.
- Prostatic tissue from male and female rats, comparison of reactions, 658.

Protein(s)—

and metaphosphoric acid, combination, 166.

biological value, effect of level of calcium intake, 142.

chemistry of, and Liebig, 616.

chemistry of, recent advances in, 166.

clay-adsorbed, resistance to proteolytic hydrolysis, 185.

crystalline, of cucurbits, Conn.[New Haven] 760.

from various sources, nutritive value, [N.Y.]Cornell 99.

intake, effect on growth, reproduction, and longevity at different calcium levels, 453.

intake, relation to calcification rate during growth, 452.

iodinated, feeding, effect on milk production, 705.

percentages for egg production, S.Dak. 554.

serum, genic effects, 49.
structure, 471.

Proteinases, specificity, 471.**Prothrombin—**

clotting times in newborn infants, clinical studies, 155.

concentration in blood of various species, 461.

deficiency in newborn, antepartum use of vitamin K for prevention of, 156.

in newborn infant, 461.

levels in the newborn, simplified determination, 309.

purification, 166.

Protoparce sexta, see Tobacco hornworm.

Protoplasm structure, symposium on, 649.

Provitamin A—

in American whole wheat flour and bread, 145.

in watermelon, 312.

Prune(s)—

juice experiments, 17.

nectar as new Idaho product, Idaho 616.

variety tests, Ind. 668.

Psalliotia campestris, secondary spores in mycelium, 644.

Psallus seriatus, see Cotton flea hopper.

Pseudaulacaspis pentagona, see Peach scale, white.

Pseudococcus—

brevipes, see Mealybug, pineapple.

comstocki, see Mealybug, Comstock.

cuspidatae, pest of genus *Taxus*, 828.

nipae, see Mealybug, coconut.

Pseudomonas—

aeruginosa, plant pathogen, 70.

fluorescens, notes, Pa. 686.

lipolytic activity, 809.

putrefaciens, relation to surface taint in butter, distribution and sources, Iowa 263.

Pseudophycus utilis, parasite of coconut mealybug, effective use, P.R. 695.

Psittacosis and meningopneumonitis virus, comparative study, 565.

Psylla mali, see Apple sucker.

Psylla pyricola, see Pear psylla.

Pterophorus periscelidactylus, see Grape plume moth.

Ptinus tectus, biology and behavior, 95, 549.

Ptychogaster cubensis, wood-decaying fungus of southern oaks and waxmyrtle, 390.

Public administration, improving, Iowa 445.

Public assistance, rural, effect of defense program, 739.

Puccinia—

asparagi, notes, 385.

distincta, cause of English marigold rust, 243.

graminis tritici—see also Wheat stem rust.

physiologic specialization in South America, 71.

unusually virulent race in Peru, 988.

telocarpum n.comb. on *Ocimum adscendens*, 530.

schedonnardi, notes, Ariz. 805.

Puerto Rico Station report, 322, 755.

Puerto Rico University Station report, 323.

Pullet(s)—

and cockerels, comparative growth response to protein supplements, Wash. 404.

cost of production, Ariz. 869.

disease, blue comb, or "X" disease, isolation of filtrable virus from, 720.

from old and young breeders, viability, N.J. 360.

growth rate relation to sexual maturity, N.J. 403.

layers, White Leghorn, rations and feeding methods, Ohio 260.

laying, controlled feeding, 559.

laying, effect of ultraviolet irradiation, Ind. 698.

mineral metabolism, 409.

pastures for, Tenn. 404.

range for, restricted feeding with, Mass. 837.

Rhode Island Red, infected with paralysis or leukemia, growth rate, Mo. 99.

White Leghorn, winter egg production characteristics, relation to shank color, 260.

Pullorum-agglutinating chicken serums, electrophoretic study, 722.

Pullorum disease—see also *Salmonella pullorum*.

chick resistance to, effect of diet, Ill. 496.
control, commercially prepared antigen for, Ill. 564.

eradication, Mass. 858.

genetic resistance to, [N.Y.]Cornell 47.
in chicks, Idaho 709.

resistance, development in poultry, Ariz. 788.

resistance in poultry, inheritance and progeny testing, Ill. 496.

- Pullularia pullulans* injury to red pine, 245.
 Pulp and paper manufacture, microbiological control, advantages, 20.
 Pulse rate of Europeans, effect of tropical environment, 307.
 Pumpkin(s)—
 canning, improvement in type and quality, Iowa 220.
 disease, rare, 229.
 Pythium spp. on, Mo. 67.
 variety tests, P.R.U. 221.
 Purdue University notes, 160, 466.
 Purple scale control, Fla. 822.
Pyrausta nubilalis, see Corn borer, European.
 Pyrethrins—
 determination, Sell v. mercury reduction method for, 335.
 effect on rodents, 826.
 Pyrethrum—
 analysis, 335.
 insecticidal action on houseflies, effect of sesamin and related compounds, 830.
 Pyridine carboxylic and aminobenzoic acids, fungistatic properties, 532.
 Pyridoxin—see also Vitamin B₆.
 deficient diet and dermatitis, 457.
 determination, Scudl colorimetric method for, 762.
 requirement, possible sparing action of inosinic acid on, 745.
 specificity for growth of excised tomato roots, 488.
 Pyrimidine studies on older subjects, 314.
 Pyruvic acid in blood following glucose ingestion, 603.
 Pythiaceae, composition of hyphae, 340.
Pythium—
 arrhenomanes on cereals and grasses in northern Great Plains, 231.
 arrhenomanes, relation to milo disease, 812.
 debaryanum on alfalfa seedlings, Iowa 681.
 growth and thiamin, 351.
 spp. on fibrous-rooted begonia, pumpkin, etc., Mo. 67.
 Q fever, epidemiology, studies, 111.
 Quackgrass—
 control by cultivation, Wyo. 793.
 seed germination, 512.
 seed, identification, Wis. 505.
 Quail—
 bobwhite, foods and conservation farming, 545.
 bobwhite, tegmentum vasculosum in cochlea, development, 246.
 fall feeds, Pa. 546.
 management, Iowa 245.
 valley, studies, Calif. 694.
Quercus—
 host-parasite check-list revision, U.S.D.A. 877.
 hybridism, ecotypes, and peripheral race variants in, 82.
 Macrocarpa in Alabama 777.
 Quinine in bark, determination, standardization of methods, P.R. 617.
 Rabbit(s)—
 cereal grass juice for, Mo. 98.
 cottontail, nests and nestlings, 544.
 cottontail, studies, Iowa 245.
 digestible nutrients of feeds for, Pa. 546.
 forage requirements of range vegetation by, Ariz. 819.
 genetic linkage in, 496.
 hazard to coniferous plantations, Mich. 245.
 heat production, effect of previous adaptation to temperatures, 407.
 juvenile, initiation and maintenance of pregnancy in, 209.
 ovum in vitro, nutrition of, 789.
 pathologic tissue changes produced by sulfathiazole and sulfathiazoline, 564.
 repellents, Ind. 694.
 snowshoe, reports of observers, 246.
 tick, parasite of, 553.
 Rabbitbrush, rubber from, Nev. 227, Utah 676.
 Rabies—
 diagnosis, probability of error in, 710.
 vaccine for prophylactic immunization of dogs, 858.
 vaccines, experimental studies, 274.
 Raccoon(s)—
 ecology and management, Iowa 245.
 use of rock exposures for den and escape cover, 391.
 Radiation—see also Solar radiation.
 intensity and illumination climate, 181.
 ultraviolet solar and sky, spectral range, use, 181.
 Radish—
 boron deficiency in, N.J. 371.
 growth and development, effect of boron, 78.
 growth, effect of vitamins, 39.
 Ragweed borer parasite, Va. 824.
Raillietina—
 cesticillus in fowl, removal by short periods of starvation, 571.
 (*Raillietina*) *bakeri* n.sp. in squirrels, 419.
 Rainfall—see also Precipitation.
 effect on movement of soil nitrogen, Ga. 770.
 in India, long-range forecasts, 22.
 relation to drainage and other factors, 21.
 runoff, year's record at State College, Mich. 182.
 Raisins, yield, composition, and quality, relation to maturity of grapes, Calif. 839.
 Ram(s)—
 breeding capacity, Mo. 47.
 semen storage, Mo. 47.
 spermatozoa staining method, 500.
 sterile, lack of response to ascorbic acid therapy, Idaho 697.
 Ramie fertilizer tests, Fla. 791.
 Ramie production tests, Fla. 791.
 Ranch(es)—
 mixed, financial and physical data, N.Mex. 435.

Ranch(es)—Continued.

organization and management in granite area, Calif. 732.

organization and operation, Nev. 130.

Randia to *Rhododendron*, host-parasite check-list revision, U.S.D.A. 377.

Randu tree podborer, life history and control, 402.

Range(s)—

carrying capacity, improved method of determining, N.Mex. 403.

desert grassland, relation to climatic and grazing conditions, Ariz. 791.

forage, estimating value for grazing, Nev. 795.

forage production, relation to time and frequency of harvesting, Wyo. 794.

grasses, *see* Grass(es).

land conservation and use problems, 98.

livestock, phosphorus and calcium supplements for, N.Mex. 100.

of Nevada, Bronco grass on, Nev. 662.

of New Mexico, reseeded practices for, N.Mex. 507.

of South Dakota, carrying capacity, S.Dak. 554.

plants, poisonous, *see* Plant(s), poisonous, Cattle poisoning, and specific plants.

plants under cultivation, economic value, Ariz. 791.

restoration studies, N.Mex. 366.

rodents and wildlife on, interrelations, Calif. 694.

San Joaquin Experimental, description, Calif. 755.

San Joaquin Experimental, program, studies and experiments, Calif. 601.

soils, overgrazed v. protected, 487.

***Ranunculus*—**

in North America, geographical distribution centers, 32.

relation to North American floras, 777.

Raspberry (ies)—

and apple juice, demonstration sale, 17.

anthracnose, new spray for, U.S.D.A. 377.

black, anthracnose-resistant, breeding, Iowa 220.

black, breeding, Ill. 516.

breeding for hardiness and disease resistance, Wash. 372.

breeding improved varieties, Tenn. 371.

canes, method of determining when killed by extremes of temperature, 513.

composition, Tenn. 327.

culture, diseases, and insects, N.Y.State 520.

fruitworm, studies, U.S.D.A. 88.

insects, life history and control, Wash. 92.

leaf spot, U.S.D.A. 805.

mulching experiments, Ky. 800.

necrotic "fern-leaf" mosaic, 241.

plantations, organic matter for, N.J. 371.

Raspberry (ies)—Continued.

preserved by frozen-pack method, ascorbic acid in, 152.

resistance to low-temperature injury, Wis. 513.

sawfly, notes, Del. 245.

varieties, N.Mex. 371.

vitamin C in, 605.

winter hardiness in, nature, Mass. 800.

Rat(s)—*see also* Rodent(s).

albino, egg, ovary, and oviduct in, relations, 654.

and pigeons, relation of protein and purine metabolism in, 698.

castrated, long bones of, 50.

choline-deficient, biochemical defect in, 889.

control, using baits in, 544.

copper-induced pseudopregnancy in, 362.

cyclical activity, apparatus for recording, 498.

diurnal metabolic and activity rhythms, Mo. 103.

fasted hypophysectomized, blood sugar and glycogen stores, effect of thyroxin, 503.

graying, failure to cure or prevent with *p*-aminobenzoic acid, 751.

hairlessness in, completion of studies, Ill. 496.

hemoglobin content, relation to meat scrap or fresh beef, N.J. 403.

hypophysectomized—

effect of follicle-stimulating and interstitial cell-stimulating hormone injections, 501.

effect of purified pituitary preparations on, 301.

response to growth hormone, 404.

immature female, potency of stilboestrol in, 502.

"light oestrous" response, hereditary factors conditioning, 655.

mite, tropical, Del. 245.

nutrition, pantothenic acid in, 893.

on meat diets, growth, reproduction, lactation, etc., of, Iowa 303.

parturition data and subsequent oestrous, and ovulation, 499.

poisoning, studies, 394.

preference for inbred and hybrid corn, Ill. 554.

rate of breeding, effect on ability to reproduce, [N.Y.]Cornell 47.

reproduction and lactation, effect of simplified diet, 98.

rib, costochondral junction of, effect of growth hormone injections, 789.

spectacle-eyed—

and biotin deficiency, 599.

and inositol, 316.

stub, developmental abnormalities and spontaneous diseases in, 497.

survey, ecological, Ind. 694.

taillessness in, heredity and accident as factors, 361.

Bats—Continued.

- tibia and rib ossification, effect of crystalline oestrin implants, 362.
- treated prepuberally with oestrogen, modification of reproductive capacity in, 655.
- vitamin requirements, effect of exercise, Pa. 589.

Rayon—

- fabrics, shrinkage determination, new methods, 320.
- taffetas, wear tests, 320.

Recurvata milleri, see Lodgepole needle miner.

Red berry mite, studies, U.S.D.A. 88.

Red mite, European—

- control, oil sprays for, Mass. 820.
- notes, Conn. [New Haven] 822.

Red scale, California—

- control, improvements in, U.S.D.A. 88.
- on citrus, mortality, cause, 548.
- out-of-doors in Berkeley, 549.
- use of kerosene-rotenone spray for, problems, 549.

Red scale, failure to control with hydrocyanic acid, cause, 2.

Red spider—

- control in greenhouse, U.S.D.A. 88.
- control with insecticides, 395.
- on carnations in greenhouses, control, 2.
- on greenhouse plants, control, Mass. 820.
- spray mix, rotenone for, Pa. 546.

Red squill—

- fortification with extract of red squill, 544.
- research, Mass. 820.

Red canary grass, fertilizer needs, Wis. 504.

Refrigeration—see also Locker plants, farm, 278.

Relief, agricultural, measures and raising of farm prices, U.S.D.A. 293.

Relief, rural administration and financing in New York, [N.Y.] Cornell 130.

Religion and assimilation of Dutch in Michigan, Mich. 301.

Reproduction in livestock, role of endocrine secretions and nutrients in, 258.

Reproductive capacity of rats treated prepuberally with oestrogen, modification, 655.

Resazurin-rennet test, studies, 106.

Research—

- Laboratory, Western Regional, Utah 323.
- procedures, 322.

Respiration—

- and mitotic periodicity in plants, correlation, 81.
- in plant cells, relation to accumulation of chlorides by, 201.
- measurement in plants, relation to passage of air through, 492.
- of *Blotaea*, 202.
- rate of leaves, metabolism of carbohydrate, protein, and organic acids in, relations, 201.

Respiration—Continued.

- total, of yeast, separation of an "activity" metabolism from, 201.

Retioultermes tibialis in cottonseed hulls, 247.

- Revenue curves, total, shape of, 583.

Rhagoletis pomonella, see Apple maggot and Blueberry maggot.*Rhinotrichum griseo roseum* n.sp., description, 238.*Rhipicephalus*—

- glabroscutatum* n.sp., description, 851.
- sanguineus*, see Dog tick, brown.

Rhizobium—

- leguminosarum*, hydrogenase in, 195.
- spp. and legumes, 350.
- spp., biotin as growth factor, 352.
- strains, limited numbers of nodules produced on legumes by, 36.
- trifolii*, oxidation and assimilation of glucose by, 777.
- trifolii* strains, relative efficiency, effect of soil fertility, 488.

Rhizoctonia—

- bataticola* on potatoes in Illinois, U.S.D.A. 377.
- diseases of potato and vegetable crops, Fla. 806.
- on potato, control by seed treatment, Me. 228.
- removal from potato tubers by chlorinated lime treatment, 75.
- solani* from potatoes, sclerotial isolates, temperature relations, 685.
- solani* from subterranean clover seed, 683.
- solani* isolates from wheat, growth in soil and parasitic action, 381.
- solani*, on corn, 234.
- solani*, stem-end tuber rot due to, 685.

Rhizopus stolonatus growth, factors affecting, 778.

Rhode Island College notes, 468, 612.

Rhode Island Station notes, 468, 612.

Rhododendron(s)—

- culture, N.J. 371.
- top blight, U.S.D.A. 805.

Rhodotypos to *Rondeletia*, host parasite check-list revision, U.S.D.A. 527.*Rhopobota naevana*, see Fireworm, black-headed.

Rhubarb—

- breeding, Ind. 668, Pa. 513.
- vitamin C in, Wash. 447.

Rhyacionia buoliana, see Pine shoot moth, European.

Riboflavin—

- analysis of cereals, 621.
- and thiamin in food products, combined determination, 10.
- and thiamin metabolism, 698.
- annotated bibliography supplement, 151.
- bacterial growth activity, effect of factor in blood, 151.
- deficient chicks, metabolism and food utilization, 839.
- deficient eggs, effect on embryonic development, 790.

Riboflavin—Continued.

- deficient rats, succinoxidase system in, 894.
- deficiency, effect on fatal pneumococcal infection in mice, 110.
- deficiency in man, excretion test as measure, 750.
- deficiency in rat, pathology, 314.
- deficiency, xanthine oxidase content of rat liver in, 457.
- destruction by light, 622.
- determination, comparison of methods, 10.
- determination, modified microbiological method, 11.
- effect on curled-toe paralysis and growth in chicks, 262.
- for poultry, dried whey as source, Idaho 697.
- in fish products, 151.
- in green snap beans, effect of freezing, canning, and dehydration, 891.
- in isolated roots, 351.
- in rye and its milled products, 146.
- in tissues of adults at liberal levels of intake, 456.
- in urine and other biological fluids, fluorometric determination, 621.
- in wheat and corn, 148.
- rat growth assay method for, 749.
- reduction by streptococci, [N.Y.]Cornell 33.

Rice—

- and byproducts, nutritive studies, Ark. 803.
- blast in Arkansas, U.S.D.A. 377.
- diseases, 67, 71.
- dry and wet cultivated, protein and mineral constituents, nutritive value, 883.
- insects, 394, U.S.D.A. 91.
- panicles, adventitious roots on, 510.
- plants affected by *Gibberella fujikuroi*, pathological anatomy, 813.
- plants, growth, effect of vitamin B₁, 195.
- precooked dry, new canned product, 139.
- production on poor lowland soils, Mo. 214.
- quality in, 883.
- respiration, fermentation, and growth in, effect of oxygen, 202.
- root rot studies, 232.
- rough, marketing, La. 869.
- stalk borer, U.S.D.A. 91.
- stinkbug, notes, U.S.D.A. 91.
- varieties, Mo. 214.
- varieties, protein and mineral constituents, nutritive value, 883.

Rhizinus communis, traumatic acid and mitosis in, 31.

Rickettsia burnetti, studies, 111.

Robillarda agrostidis, notes, 72.

Rocky Mountain spotted fever increase, importance of rodent trapping, Del. 245.

Rodent(s)—see also Mice and Rat(s).

and wildlife on range, interrelations, Calif. 694.

control, Ind. 694.

Rodent(s)—Continued.

- control, engineering aspects, 431.
- effects of pyrethrins on, 826.
- pests in New York, economics and biology, [N.Y.]Cornell 85.
- pests of Iowa, control, Iowa 820.
- preference for different forest species, Pa. 524.
- trapping, importance, due to increase of Rocky Mountain spotted fever, Del. 245.

Romalea microptera, see Grasshopper, eastern lubber.

Root(s)—

- flora and fauna associated with, methods of observing, 637.
- growth, formative effects of carbohydrates on, 354.
- knot control, Fla. 806.
- knot nematode—
 - control, Miss. 238.
 - control, chloropicrin and ethylene dichloride for, 819.
 - cultural measures for control, 238.
 - larvae, transient feeding, 819.
 - of potato, Nev. 236.
 - studies, S.C. 378.
- knot prevention and control, Miss. 381.
- meristems, cell growth and division in, 31, 785.
- nodule bacteria, oxidation and assimilation of glucose by, 777.
- of *Vicia faba*, relation between xylem thickenings and elongation, 358.
- systems, new, growing by soil banking, 531.
- tips, isolated, riboflavin in, 351.
- tips under varying light conditions, periodicity and rhythmicity of mitotic phases, U.S.D.A. 485.

Rootstock tests, Ariz. 799.

Rosa, host-parasite check-list revision, U.S. D.A. 527.

Rose(s)—

- black spot control, 692.
- black spot, varietal resistance, tests, U.S.D.A. 680.
- breeding, S.Dak. 513.
- chafer control, Mich. 831.
- Crimson Rambler and its progenies, 523.
- crown gall, effect of crop rotation on, 244.
- culture and fertilization, Pa. 513.
- diploid and polyploid, crossing relations, 47.
- effect of trenching and soil mixtures, 676.
- greenhouse, effect of sprays on apparent photosynthetic rate, 226.
- greenhouse, fertilization, Ill. 523.
- greenhouse, method of watering, [N.Y.] Cornell 64.
- greenhouse, photosynthesis, effect of spray materials, Ohio 203.
- growth, effect of soil temperature, Mass. 775.

Rose(s)—Continued.

- hips, wild, vitamin C in, 605.
- mosaic, effect of temperature on symptom expression, 244.
- organic matter sources for, [N.Y.]Cornell 64.
- peat moss as soil amendment, 226.
- planting and mulching methods, [N.Y.] Cornell 64.
- research on, 543.
- root knot, effect of crop rotation on, 244.
- soil aeration for, [N.Y.]Cornell 64.
- species of North America, distribution, 676.
- stocks, breeding and testing, Iowa 220.
- testing for heat resistance and use as cut flowers, Iowa 220.
- understock resistant to root knot nematode, U.S.D.A. 377.
- winter injury, causes and protection, 543.

Rosmarinus to *Rubus*, host-parasite check-list revision, U.S.D.A. 680.

- Rotation of crops, Fla. 769, Mo. 22, N.Y. State 801, Va. 793.
- effects of limestone and fertilizers in, N.C. 344.
- ordinary, grazed, manured, and fertilized, Wyo. 793.

Rotenone—

- color reaction, adaptation to photoelectric colorimeter, 397.
- containing plants, evaluation problem, 826.
- crops, physiology of, P.R. 646.
- dust in pea weevil control, reduced per acre poundage possible, Idaho 694.
- kerosene spray, caution urged in use, 547.
- melting point, effect of soft glass on, 179.
- producing plants, culture and handling, P.R. 608.
- toxicity, 396.

Roughages, vitamin A and D content, factors affecting, S.Dak. 563.

Royal jelly of Florida, composition and nutritive value, Fla. 880.

Rozella—

- achlyae* n.sp., description, 808.
- cladochytrii* host range, 230.
- endochytrii* n.sp., notes, 230.
- rhizophyctii* n.sp., notes, 230.
- synopsis, 230.

Rozellopsis—

- new genus proposed, 230.
- synopsis, 230.

Rubber—

- from rabbitbrush, Nev. 227.
- from western desert plants, Utah 676.
- growing, pests and diseases in, 390.
- thread, synthetic development, 753.

Rudbeckia bicolor, relation of photoperiodic induction to photoperiodic inhibition in, Mo. 32.

Rumen—

- absorption from, 698.
- bovine, motility, effect of drugs on, 853.

Ruminants—

- digestibility studies, 257.
- H and CO₂ production in digestive tract, relation to respiratory exchange, Mo. 103.

Runoff—

- and erosion, effect of plant cover, Wash. 343.
- and erosion, measuring, tilt buckets for, 861.
- cycle, outline, 631.
- divisors, small-fraction, calibration, Tenn. 342.
- from small watersheds, hydrologic studies and measurement, Ind. 725.
- infiltration in relation to, 632.
- measurements, equipment for, 120.
- studies, Idaho 724.

Rural—

- church, relation to other social organizations and agencies, 878.
- Electrification Administration, report, U.S.D.A. 278.
- labor, *see* Agricultural labor.
- life, effect of tenure status, S.Dak. 737.
- operations and credit in State, Mass. 866.
- organizations, factors determining effectiveness, Iowa 300.
- population of Virginia, income and living standards, 164.
- schools, *see* School(s), rural.
- youth problems, Minn. 445.

Rust—

- earliest known epiphytotic of in Iowa, 191, 228.
- early leaf, development in eastern Nebraska, U.S.D.A. 680.
- fungi taxonomy, Ind. 679.
- mites on citrus, 554.

Rye—

- adaptation to lowland soils and production methods, Mo. 213.
- and milled products, vitamins in, 146.
- and winter and spring wheat varieties, comparison, Wis. 505.
- breeding, S.Dak. 504, Wash. 367.
- for winter pasture of sows, Ill. 554.
- glandular epithelium of scutellum, cytoplasmic inclusions in, 784.
- hybrids, inheritance of disease resistance, Wash. 367.
- immature, freezable water and oxygen respiration in, 492.
- varieties, Mo. 214.
- variety tests, S.C. 367, Wash. 367, Wyo. 793.
- yields and production costs, Mo. 53.

Ryegrass—

- as weed and control, N.J. 366.
- perennial, new alkaloid from, isolation, 492.

Sabal to *Salix*, host-parasite check-list revision, U.S.D.A. 681.

Saccharomyces cerevisiae strains, effect of vitamins, 644.

- Saccharum spontaneum* variants, comparative analysis of vegetative characteristics, U.S.D.A. 651.
- Saddleback caterpillar, notes, Del. 245.
- Safflower—
dieback in Texas, U.S.D.A. 680.
fungus disease, little known and rare, 229.
tests, N.Mex. 360.
varieties, N.Mex. 371.
- Saissetia*—
nigra, shipment to California, P.R. 695.
oleae, see Black scale.
- Saliva, human fluorine in, 890.
- Salix*, host-parasite check-list revision, U.S.D.A. 805.
- Salmonella*—
brederney infection in birds, 858.
enteritidis, food infected with, housefly as vector of infection, 553.
genus, beta phases and undescribed types, 419.
in lymph glands of hogs, 856.
infection and carrier state in mice, effect of sulfanilylguanidine, 712.
infections of pigeons in Dutch East Indies, 427.
new type with undescribed flagellar antigens, 712.
- pullorum*—see also Pullorum disease.
in fowl, genetic resistance to, relation to body temperature, [N.Y.] Cornell 722.
species, frequency of occurrence, 712.
spp., nutritional requirements, comparison, 111.
types in silver foxes, 118.
types, isolation of, Mass. 858.
typhi, stability of Vi antigen of, 420.
typhimurium cause of death of week-old wood ducks, 277.
typhimurium infection in chinchillas, bacterin treatment, 118.
typhimurium infection in muskrats, 420.
- Salsify, leaf spot disease, 79.
- Salt, absorption in farm-cured ham, hastening, Pa. 836.
- Samanea* to *Sassafras*, host-parasite check-list revision, U.S.D.A. 805.
- San Jose scale—
in cranberry bogs, dormant sprays for, Wash. 394.
scale studies, Ill. 546.
- Sand flies, studies, U.S.D.A. 89.
- Sandy—
loam, Collington, organic matter in, 25.
soils, need of phosphate and potash, Wis. 483.
soils of central Florida, adsorption and fixation of copper in, 190.
soils, suitability of summer cover crops, Fla. 799.
- Sanninidea celtiosa*, see Peachtree borer.
- Saperda tridentata*, see Elm borer.
- Sapodilla* rust in Florida, U.S.D.A. 680.
- Sarcophaga*—
austrana, new parasite from mantids, description, 255.
bullata, cause of intestinal myiasis, 553.
- Sardine oil as vitamin D supplement for poultry, Idaho 697.
- Sauerkraut—
canned, quality and chemical composition, relation, 18.
manufacture, common errors in, 18.
pink, cause, 33.
processing, 19.
vitamin C in, and changes during storage, 459.
- Sausage, starch determination in, 330.
- Saw, small electrically operated cross-cut, U.S.D.A. 124.
- Sawdust burners, rating and care, 281.
- Scab gnats, relation to potato tuber defects, [N.Y.] Cornell 90.
- Scabies, effects of drugs on, histological comparison, 111.
- Scale insects—see also Black scale, Purple scale, and Red scale.
on bamboo, control, P.R. 695.
on citrus, control, Fla. 822.
on citrus, control problems, 549.
sprays for, Wash. 393.
studies, Ariz. 819.
- Scaptiscus*—
acetus, see Cricket, southern mole.
vicinus, see Changa.
- Schistosomes, new, from birds of Wisconsin and Michigan, 86.
- School(s)—
administration in Pope County, Ill. 583.
districts, public finance situation in, with and without oil development, Okla. 730.
rural elementary, planning lunches for, 306.
secondary, biology teaching in, 136.
- Scientific and technical periodical publications, catalog, 755.
- Scientists face the world of 1942, 609.
- Scirtothrips citri*, see Citrus thrips.
- Sclerospora*—
noblei, conidial phase, 75.
philippinensis, notes, 234.
sacchari mildew of sugarcane and other grasses, 236.
- Sclerotinia*—
fruticola cankers on peach, [N.Y.] Cornell 68.
fruticola on peach, apothecia of, 816.
laxa in stone fruits, arsenite sprays for, 540.
on Great Northern beans, U.S.D.A. 377.
sclerotium growth, effect of chemicals, Ariz. 805.
sclerotium on poppy in Oregon, U.S. D.A. 805.
stem rot on *Oenothera cyanus* and *Delphinium ajacis*, Mo. 67.

Sclerotium—

bataticola, cause of damping-off in seedling conifers, 83.

bataticola from subterranean clover seed, 683.

rolfsii, cultural characters and mechanism of parasitism, 529.

rolfsii growth and parasitism and host relations, Fla. 806.

rolfsii, studies, 529.

Scolytidae, food plant relations in Hawaii, 546.

Scolytus—

multistriatus, see Elm bark beetle, smaller European.

sulcatus on apple trees, relation to Dutch elm disease control program, 550.

Scours in dairy calves, 272.

Screwbean, nomenclature, Ariz. 776.

Screwworm(s)—

larvae, acquired resistance to phenothiazine by, 255.

larvicides and wound protectors against, 255.

studies, U.S.D.A. 89.

Scurfy scale control with insecticides, 395.

Scurvy—

development, effect of intermittent consumption of vitamin C on, 895.

infantile, serum phosphatase in, 606.

Scymnus creperus predator on woolly elm aphid, 247.

Seborrhea and the B vitamins, 600.

Seed(s)—

absorption of water by, factors affecting, 32.

agricultural, examination, Me. 219.

control field problems, 513.

disinfection, loss of vitality during storage resulting from, 231.

dormancy in, 32.

dormant, approximate germination tests, 512.

drier, infrared electric lamps for, 125.

flats, watering, use of wicks for, [N.Y.] Cornell 64.

germination, effects of mercury vapor, 648.

germination media, evaluation, 512.

germination tests, homogeneity in, 512.

inspection, Ind. 370, Ky. 370, Mass. 370.

law, new, of Iowa, 512.

production, relation to zinc, 646.

quality vital in all-out production, Colo. 798.

testing in home and school, U.S.D.A. 370.

testing, need of, as part of all-out food production effort, Colo. 667.

tests for 1941, results, N.H. 55.

weak, cause of crop failures, N.Y.State 798.

weed, see Weed seeds.

weight, relation to vegetative growth, differentiation, and yield in plants, 198.

X-rayed, germination, relation to catalase ratio, 195.

Seedbeds, methods of preparing for different crops, Wyo. 793.

Seed-corn maggot, biology and control, [N.Y.] Cornell 90.

Seedlings, culture in sunlight under controlled temperature conditions, 649.

Setulus mites on tobacco moth, 823.

Selection indexes, constructing to make maximum progress, 209.

Selective Service physical standards and health of school children, 311.

Selenate absorption by colloidal ferric hydroxide, 329.

Seleniferous areas, locating, use of indicator plants in, 37.

Selenite selenium absorption by colloidal ferric hydroxide, 329.

Selenium—

availability to plants, methods for determining, 613.

in toxic wheat, form in which found, 200.

indicator species of *Astragalus*, identification, 711.

poisoning, 37.

poisoning in livestock and man, 98.

poisoning prevention, arsenic for, S.Dak. 564.

poisonous to livestock, Wyo. 851.

rations for laying hens, linseed meal as supplement, S.Dak. 554.

Selenium-cystine, decomposition in electro-dialysis and acid hydrolysis, 332.

Semen—

bovine, fecundity, effect of diluters and storage, 209.

collections, first and second, from dairy bulls, comparison, 209.

production in fowl, relation to light, [N.Y.] Cornell 47.

ram, concentration and metabolism of sugar in, Mo. 210.

stored, preservation, [N.Y.] Cornell 47.

Senecio—

alkaloids of South Africa, 851.

poisonous to livestock, Wyo. 851.

Sensitization studies, 272.

Sepsis cynipsea, nematode parasite of, morphology, 302.

Septic tank dimensions, studies, Ill. 573.

Septoria—

apii gravcolentis in Argentina, 538.

leaf blight of chrysanthemums, 243.

secalis stipae n.var., notes, 72.

spores, structure and germination, 538.

Sequoia bark fibers, 753.

Serratia marcescens—

as cause of pink sauerkraut, 38.

lethal effect of drier rolls on, 348.

Serum(s)—

human and animal, surveys for *Mickettsia burnetti* agglutinins, 111.

proteins, genic effects, 49.

Sesame—

fertile tetraploids induced by colchicine, 44.

Sesame—Continued.

oil, studies, U.S.D.A. 5.

production tests, P.R.U. 213.

Sesamin, effect on insecticidal action of pyrethrum on housefly, 830.**Sesamum orientale**, sterility in, cytological study, 495.**Sewage—see also Sludge.**

oxidation of carbonaceous and nitrogenous materials in, N.J. 428.

sludge incinerator ash, use for commercial purposes, N.J. 428.

sludge, plant nutrients in, effect of processes of treatment, N.J. 428.

stale, odors produced by, control, N.J. 428.

treatment, grease problem in, 726.

treatment processes, sources of odor in, N.J. 428.

Sex hormones, see **Hormones**.**Sexual—**

maturity factor in plant juices, 654.

maturity in female rat, attainment, 654.

periodicity, exteroceptive factors in, 498.

Shallot pink root, U.S.D.A. 528.**Shark-liver oil—**

feeding, effect on milk production and blood vitamin A, 410.

vitamin D in, for poultry, Fla. 833.

Sheep—see also Ewe(s) and Lamb(s).

artificial insemination in, Mo. 47.

bighorn, source of parasite infection of domestic sheep, Wyo. 273.

blood phosphorus and phosphorus requirements, Idaho 697.

breed crosses, comparison for early lamb production, Pa. 554.

chromosome counts, Mo. 47.

cobalt deficiency in, development, 716.

copper in blood of, 115.
crossbreeds, wool and lamb characters, Wyo. 788.

different cuttings and baled alfalfa hay for, N.Mex. 403.

dipping tank, portable, Mo. 120.

drives, eastward, from California and Oregon, 556.

dwarfism in, inheritance, 209.

fertility at high altitudes in Peru, 209.

fiber coats for, Wyo. 834.

foot rot, cause, epidemiology, and control, 273.

genetic studies, Wyo. 788.

grazing Pingue with, N.Mex. 403.

helminth parasites of, 716.

migration in Intermountain Region, U.S.D.A. 131.

multiple pregnancies experimentally produced, fate of, 209.

Navajo, improvement, evaluation of fleece yield in, 208.

of various breeds and crossbreeds, fleece and mutton production, Fla. 788.

of various breeds, lamb and wool production, N.Mex. 403.

on ranches, financial and physical data, N.Mex. 435.

Sheep—Continued.**parasite(s)—**

internal, Mo. 717.

larvae in feces, effect of phenothiazine-salt mixtures on, 570.

on irrigated pastures, Oreg. 856.

phenothiazine failure to control, 116.

parasitic diseases, control measures, tests, 570.

pinning in, effect of cobalt-rich fertilizers, 570.

poisoning from cloak fern, Tex. 565.

poisoning from lichen, control, 162.

production, rotational grazing and internal parasites in, Fla. 833.

range, weanling and yearling fleece characters in, relation, 97.

rations, effect of added glucose on digestibility of protein and of fiber, 406.

removal of gastrointestinal parasites with phenothiazine, 271.

rock phosphate as mineral supplement for, 97.

shipped into Minnesota, Minn. 732.

stomach, nodular, and tapeworms, pathology and comparative damage, Mo. 108.

treated with phenothiazine, blood picture, 856.

types and breeding for southern Illinois lamb production, Ill. 496.

with no tails, development, S.Dak. 554.

wool yield calculations for breeds, 556.

worm-free, effect of phenothiazine on weight, 423.

worm parasites of digestive tract, control. [N.Y.] Cornell 109.

Shelterbelt(s)—

effect on air movement, Ind. 677.

trees, variety tests, Wyo. 801.

Shortenings—

new, water tolerance, relation to sweeter cakes at higher altitudes, Colo. 304.

nutritive properties, 440.

Shrimp meal as protein source for chicks, Miss. 702.**Shrubby planting, pruning recommended for, Miss. 221.****Shrubs—**

and weeds effect on weight gains of cattle grazing pastures, Colo. 258.

desirable varieties, N.J. 371.

growth in shelterbelt, effect of fertilizer and culture, S.Dak. 513.

in California deserts, dependence of annual plants on, 353.

ornamental, testing, Wash. 372.

toadstool root rot of, 542.

Sidine stimulea*, see Saddleback caterpillar.*Silage(s)—**

alfalfa-bromegrass v. corn, for dairy cows, Ind. 704.

alfalfa, preserved with molasses, phosphoric acid, salt, and inoculation, fermentation of, 413.

alfalfa, v. Atlas sorgho silage for dairy cows, Ariz. 841.

Silage(s)—Continued.

- and hay, feeding value, Vt. 563.
- corn, harvesting, processing, and storing, methods and equipment, Iowa 284.
- corn, yields and production costs, Mo. 53.
- evaluation of quality in, role of pH determination, 404.
- for dairy cattle, comparison, N.J. 410, Tenn. 411.
- grass and corn, effect on milk flavors, Mass. 842.
- grass and corn, need for separate silo reinforcing schedules, N.J. 428.
- grass and legume, preparation and use, with molasses or phosphoric acid, N.J. 410.
- grass, carotenoids of, 702.
- grass, conservation of nutrients in, Vt. 848.
- grass, digestibility by dairy cows, 843.
- grass, feeding, N.J. 704.
- grass, hazardous horse feed, 857.
- grass, in wartime, Mo. 704.
- grass, nutritive value, Tenn. 404.
- grass, preservation; Wis. 555.
- grass, preserved with phosphoric acid or molasses, palatability, [N.Y.]Cornell 104.
- grass v. corn, for cows and heifers, Vt. 563.
- grass v. hay for heifers, Vt. 563.
- hay crop, making and feeding, Minn. 704.
- lawn clipping, for dairy goat production, N.J. 403.
- lawn clipping, for growing chicks, N.J. 403.
- legume, experiments, Tenn. 428.
- legume v. corn v. legume hay for fattening calves, Mich. 258.
- molasses- and phosphoric acid-alfalfa, value for dairy cows, 410.
- molasses-legume-grass v. corn, for milk production [N.Y.]Cornell 104.
- mung bean, precautions for making, Okla. 704.
- photochemical reactions in, 158.
- potatoes, corn, and sorghum for, Idaho 697.
- sorghum, value for dairy herd, Miss. 704.
- soybean-sorghum v. sorghum alone, Miss. 405.
- stack, losses and nutritive value, effect of type of construction, Wash. 428.
- sugarcane, compared to shocked cane or pasture, Fla. 833.
- types for milking cows, S.Dak. 563.
- without molasses, crops suitable for, N.J. 563.

Silica—

- gel, adaptability as culture medium, 349.
- in acid-insoluble silicates, rapid determination, 382.

Silicates, iron determination in, 384.**Silo(s)**—

- capacity for grass v. corn silage, N.J. 428.
- filling with corn and sorghum, Mo. 834.
- leakage, waste from and remedy, N.J. 428.

Silo(s)—Continued.

- pressure studies, N.J. 428.
- staves, dry tamped, durability, 121.
- types, alternative, to meet war demand for steel, 580.

Silver—

- absorption and excretion by man, 748.
- fungicides, mechanism of action, 380.
- Silvius* species west of Mississippi River, 402.
- Simulium nigroparvum*, transmission of blood protozoan of turkeys by, 724.
- Sipha flava*, predator of, shipment to Louisiana, P.R. 695.
- Siphona irritans*, see Hornfly.
- Siphonaptera of North America, index to literature, 553.

Sires—see also Bull(s).—

- proved in dairy herd improvement association, list, U.S.D.A. 846.
- proved, use in Holstein and Jersey herds, results, Idaho 703.

Sitona cylindricollis, notes, N.Dak. 832.**Skin milk powder** as substitute for skim milk in raising calves, Wyo. 842.**Skin grafts** deprived of source of melanophores, post-hatching migration of pigment cells into, 655.**Skin, oxygen consumption during hair cycle in rat and after adrenalectomy, 654.****Skunk**—

- spotted, trapping technique, Iowa 245.
- winter dens, ecological study, 545.

Slides and tissues, convenient washing devices for, 628.**Sloe, vitamin C in, 605.****Sludge, activated**—see also Sewage.

- control of bulking, effect of chlorine, N.J. 428.
- operation of plant, better control for, N.J. 428.

Slug(s)—

- baiting with metaldehyde mixed with various substances, 820.
- control, 391, U.S.D.A. 391.
- gray field, and its environment, 820.

Snails, control, U.S.D.A. 391.**Snakeroot, white, cause of milk sickness, 852.****Smut fungi, new species, 381.****Snapdragon(s)**—

- allotetraploids and autotetraploids, sterility differences, 46.
- breeding, Pa. 513.
- breeding for varietal improvement and disease resistance, Mass. 800.
- rust, 818.
- virosislike injury due to peach aphid, 94.

Sneezeweed, western, source of serious loss of sheep on high-altitude ranges, Colo. 855.**Snow melting characteristics and contribution to runoff, 632.****Snow surveys, 22.****Snowmobile, Utah, description, Utah 727.****Social**—

- change in South Dakota, basic trends, S.Dak. 444.
- conflicts and agricultural programs, 588.

Social—Continued.

sciences, rural, graduate students in, problems, 583.

sciences, rural, personnel training, 583.

Society—

American rural, role of village in, 738.

and conservation, 582.

rural, role in production of workers and soldiers, 738.

Sociological research in farm family living, 587.

Sociology, rural, studies, Pa. 586.

Sod, establishment on subsoil, N.J. 366.

Sod crops, producing, costs and practices in, Ind. 729.

Sodium—

azide, selective bacteriostatic effect of, 192.

chlorate mixtures, properties and herbicidal action, Iowa 213.

cyanide, effect on soil processes, N.J. 342.

determination, 172.

importance for plant nutrition, 29.

pentachlorophenate, toxic effects on water hyacinth, 354.

Soil(s)—

adapted to pasture, availability of calcium and phosphorus of colloidal phosphate applied to, Fla. 769.

adsorption of barium and hydroxyl ions by, relation to pH, 642.

aeration, conditions affecting, Miss. 27.

aggregates, effect of micro-organisms, 28.

aggregates, physicochemical aspects, 24.

aggrigant, studies, Me. 183.

air capacity, measuring, 161.

air, effect on plants, Miss. 27.

alkali, *see* Alkali.

American, auxins in, 344.

analysis, rapid chemical methods, 174.

and cropping systems, microbiological action in, interrelation, Fla. 769.

and field crop management, [N.Y.] Cornell 483.

and lime, testing, Iowa 183.

and plant relations, Fla. 760.

and related materials, complete and partial analysis, methods, Fla. 760.

and water conservation, Fla. 768.

bacteria producing bactericidal agents, isolation, 192.

bacteria to solve shortage of indicator litmus, N.Y.State 773.

bacterial activity, effect of different soil treatments, Mo. 22.

bacteriostatic and bactericidal substances in, 486.

base exchange capacity determination, 173.

base exchange in, 186.

capillary tension and moisture in, relation to capillary conductivity, Iowa 183.

characteristics affecting plant growth and composition, determination, 478.

Soil(s)—Continued.

chemistry and Liebig, 616.

classification, genetic, relation to properties of soil groups, 23.

clods, saturated and dry, volume change and pore space, 185.

colloids, *see* Colloids.

Conservation and Domestic Allotment Act, amended, U.S.D.A. 437.

conservation—

and increased production by farmers' cooperation, U.S.D.A. 639.

benefits, evaluation, needed developments in, 582.

benefits, physical evaluation, problems, 582.

by manure and cover crops, N.J. 342.

economic and social aspects, bibliography, U.S.D.A. 300.

folders for farmers and ranchers, U.S.D.A. 639.

in area approaching a worn-out condition, 187.

new landmarks, U.S.D.A. 26.

practices in Oklahoma, 187.

practices recommended in Texas, 187.

program too complicated for average New Jersey farm, N.J. 342.

program too complicated for average New Jersey farm, correction, N.J. 769.

programs for individual farms, Iowa 283.

publications, bibliography, Okla. 344.

relation to varieties and use of agricultural machinery, 430.

research on wind-blown soils, Mass. 769.

with organic matter, S.C. 342.

with stubble mulch, 122.

content of runoff and soil moisture, determination, Tenn. 342.

correlations, Fla. 769.

cropping and treatment, value as shown by Morrow plats, Ill. 482.

cultivated v. unbroken, loss of fertility of, Pa. 482.

defense in Oklahoma, bibliography, Okla. 344.

depleted, grass farming for improving, Ky. 507.

development and vegetational changes, quantitative correlations, 205.

diagnosis by universal soil testing system, Conn.[New Haven] 26.

dry-land, nitrogen content, 636.

effect of arsenious, arsenic, and antimony oxides, Mass. 769.

effect of different methods of slash disposal, Conn.[New Haven] 803.

erosibility—

and infiltration capacity, Tenn. 428.

relative, in Puerto Rico, P.R.U. 184.

studies, Wash. 343.

Soil(s)—Continued.

erosion—

- accelerated, in arid and semiarid Southwest, and climate, U.S.D.A. 764.
- and runoff, effect of plant cover, Wash. 343.
- and runoff from agricultural watersheds, tillage practices for, Wash. 343.
- and runoff, measuring, tilt buckets for, 861.
- at State College, year's record, Mich. 182.
- by wind, relation to roughness of surface, 26.
- control, Mo. 120, Okla. 638.
- control by irrigation water, Wash. 343.
- control dams and waterways, experimental, testing, S.C. and U.S.D.A. 429.
- control, place of terracing in, N.J. 342.
- control, relation to cropping practices, Wash. 343.
- effect of micro organisms, 28.
- effect of organic matter on, N.J. 342.
- in farm drainageways, control, 429.
- interplanting tests in hill culture to check, Iowa 220.
- losses of major plant nutrients and organic matter from sandy loam, 638.
- microscopic studies, Iowa 183.
- nature of, Mass. 769.
- on Box Elder Creek project, Nebraska, U.S.D.A. 25.
- on hillsides, control, tests of planting material for, 226.
- on steep land, control, Ky. 769.
- on Vermont permanent pastures, Vt. 638.
- studies, Iowa 183, Mo. 22.
- surveys, U.S.D.A. 184.

fertility—

- composition of alcoholic potato leaf extract and entire leaf as index, 783.
- effect of hay removal, Miss. 366.
- maintaining on irrigated land in Colorado, Colo. 188.
- plant composition as index, 772.
- "quick methods" for determining, Fla. 760.
- studies, N.C. 344, S.C. 342.
- studies in Delta area, Miss. 26.
- under field and greenhouse conditions, Fla. 769.
- flora and fauna associated with roots, methods of observing, 637.
- for petrographic analysis, preparation, 24.
- formation processes, petrographic method for study, 769.

Soil(s)—Continued.

- fumigant, methyl bromide-dichloroethyl ether emulsion as, 826.
- greenhouse, fertility studies, Wash. 343.
- greenhouse, nutrient deficiencies, Iowa 183.
- groups, representative samples, properties, 23.
- heterogeneity, relation to foliar diagnosis, 26.
- hydraulic head measurements with high water tables, 277.
- improving rotations, lysimeter experiments with, Ariz. 768.
- in containers, moisture distribution in, 27.
- inoculation with *Azotobacter chroococcum*, 637.
- iron determination in, 334.
- irrigated, changes occurring in, Wash. 343.
- irrigated, fertility, Wash. 343.
- irrigated orchard, pH values, 27.
- lateritic, aggregation and erodibility, effect of microbial activity, 773.
- light, advantages of long rotations on, Wis. 483.
- loessial, development in central U. S., Mo. 769.
- management practices recommended, Idaho 632.
- manual for Eleventh Farm Credit District, U.S.D.A. 23.
- mechanics nomenclature, 184.
- microbes, acids produced by, importance, N.J. 342.
- moisture—
 - conditions in field, tensiometers for following, 191.
 - equivalent in, relation to field capacity, 27.
 - measurement, development of field apparatus for, Iowa 183.
 - measuring, calibrated soil probe for, 185.
 - relation to pH value, 771.
 - relation to soil temperature, 771.
 - studies, Ariz. 768.
 - tensiometer materials and construction, 186.
- movement within surface profile of terraced lands, 343.
- muck, *see* Muck.
- nitrogen content, *see* Nitrification and Nitrogen.
- of Arizona, properties, effect of organic matter decomposition on, Ariz. 768.
- of Colorado, high lime content, Colo. 642.
- of Connecticut, effect of cultivation and erosion, Conn. [New Haven] 768.
- of Florida, composition, Fla. 760.
- of Florida, reaction, adjustment, Fla. 760.
- of Georgia, lime requirement, determination, Ga. 5.
- of Iowa, liming, Iowa 642.

Soil(s)—Continued.

- of Iowa, microbiological status, effect of water logging and erosion, Iowa 188.
- of Kentucky, phosphorus compounds in, Ky. 769.
- of Massachusetts, availability of potassium, effect of base exchange capacity and of exchangeable ions, Mass. 769.
- of Missouri, colloidal material in, properties, Mo. 22.
- of Missouri, lime requirements and use of lime, Mo. 189.
- of New York, physical condition and maintaining in better tilth, [N.Y.] Cornell 23.
- of Puerto Rico, classification and productivity rating, P.R.U. 25.
- organic matter in, *see* Organic matter.
- pasteurizer, constant-current resistance, 431.
- pasteurizer, insulated electric, 578.
- peat, *see* Peat.
- permeability units for, 772.
- pH and available calcium relations in fields producing scabby and clean potatoes, Mo. 183.
- phosphorus and nitrogen, effects of crop production, S.Dak. 483.
- phosphorus and potassium requirements, fixation method for determining, 774.
- physical reactions on plow disks, 122.
- Podzol, profile in Adirondack forest, effect of submergence, 633.
- probe, calibrated, for measuring field soil moisture, 185.
- productivity, effect of combining residues, Ill. 482.
- productivity, effect of texture and slope of land, N.Dak. 635.
- profiles of different series, properties, Nebr. 634.
- properties and stages of decomposition of organic matter affecting erosion, Iowa 183.
- properties, effect of waste sulfite liquor, 347.
- sampling tube with inner liner, 24.
- San Joaquin, hardpan and clay pan in, 185.
- science problems in need of prompt solution, 342.
- science relation to land-use planning, 768.
- semiarid, productive capacity and present emergency, Ariz. 635.
- shallow, response to good management, Wis. 483.
- shearing strength, technic of determining, 576.
- slick spots or scalds in, Ill. 482.
- soluble material in, relation to their classification and fertility, U.S.D.A. 770.
- structure evaluation, methods, 333.
- structure, nature, and effect on soil tilage, Mo. 22.

Soil(s)—Continued.

- survey in—
 - Michigan, Clinton Co., U.S.D.A. 632.
 - Minnesota, Roseau Co., U.S.D.A. 184.
 - Montana, Golden Valley Co., Mont. 769.
 - North Dakota, McKenzie Co., U.S.D.A. 632.
 - Puerto Rico, U.S.D.A. 343.
 - Texas, Maverick Co., U.S.D.A. 343.
- temperature, relation to soil moisture, 771.
- test plats, historical, experimentation with, Mass. 769.
- tests, quick, use and interpretation, 18.
- tests, rapid chemical, P.R.U. 184.
- tests, rapid, relation to response of truck crops, Fla. 768.
- type and manurial treatments, Iowa 183.
- types, absorptive powers, Ill. 482.
- types of Iowa, characteristics, Iowa 183.
- types of Ohio, manganese status, 346.
- types, potassium availability in, Iowa 183.
- types, productive capacities, estimation, Iowa 183.
- unproductiveness, causes and remedies, Wash. 343.
- virgin, auxin extraction from, 186.
- water, *see* Soil moisture.
- Solar radiation, ultraviolet, spectral range, use, 181.
- Solomonseal seeds, dormancy in, 648.
- Solubea pugnax*, notes, U.S.D.A. 91.
- Solution, large volumes of, continuous liquid extractor for, 474.
- Sorghastrum, host of an undescribed smut, 536.
- Sorghum—
 - and corn in alternate rows, S.Dak. 504.
 - breeding, N.Mex. 366.
 - breeding for low HCN content, S.Dak. 504.
- grain—
 - Coes, feeding value, Colo. 835.
 - culture tests, Fla. 792.
 - for dairy cows, advantage of grinding, 412.
 - ground, v. ground corn in dairy rations, S.Dak. 563.
 - pericarp histology and coloration, 236.
 - storage, 125.
 - variety tests, Ariz. 791, Fla. 791, Idaho 659, N.Mex. 366, S.C. 867, Wyo. 793.
- growing and making sorghum sirup, Mo. 627.
- seed-borne pathogens, detecting, laboratory technics, Iowa 228.
- seed germination, effect of low temperatures, 512.
- sirup, Tenn. 327.
- sirup, increased importance as sugar substitute, Miss. 740.

Sorghum—Continued.

- strain tests, Fla. 791.
- varieties, resistance to chinch bug injury, Okla. 617.
- varieties, turkeying-off, S.Dak. 703.

Sorgo—

- Atlas, as silage crop, adaptation, Ind. 659.
- variety tests, Fla. 791, Idaho 659, Ind. 659, N.Mex. 366, S.C. 367, Wyo. 793.

Sorosportum new species, description, 381.**Soursop—**

- culture, P.R.U. 800.
- flavor and acids in, P.R. 617.
- vitamin C in, P.R. 617.

South Carolina Station report, 463.**South Dakota Station** notes, 612.**South Dakota Station** report, 609.**Sows—**

- brood—*see also* Pig(s) and Swine.
- fattening, protein mixtures for, Ind. 697.
- nutritional requirements, Mo. 98.
- lactating, protein requirement, 98.
- mothering and nursing ability, differences in, 98.
- rye as winter pasture for, Ill. 554.
- with pigs, rations for, Ill. 554.

Soybean(s)—

- and soybean products, feeding, effect on milk production and quality, Iowa 263.
- and Sudan grass mixtures, tests, Ariz. 791.
- as host for immature grasshoppers, Ill. 545.
- availability of P to, Ind. 659.
- Biloxi, floral initiation, effect of grafting, 357.
- breeding, Ill. 504, Ind. 659, Iowa 212, Mo. 52, N.Mex. 366, [N.Y.]Cornell 53.
- carbohydrates, Ind. 616.
- chemical composition during maturation, 783.
- cultural and interplanting with hegari tests, Ariz. 791.
- culture tests, Ill. 504, S.Dak. 504, Tenn. 367, Wash. 367.
- diseases in Georgian S. S. R., 529.
- diseases in North Carolina, U.S.D.A. 66.
- edible, Ala. 740.
- edible, processing studies, Wash. 451.
- edible, testing, Mass. 800.
- edible varieties, Iowa 222, Miss. 304.
- edible, variety tests, S.C. 371.
- effects of boron on, Del. 212.
- fertilizer placement with, Ind. 659.
- fertilizer, seeding rates, and time of harvest for, N.J. 366.
- fertilizer tests, Ind. 659, S.C. 367.
- fibers in mixtures of textile fibers, identification, 318.
- for grain, Miss. 366.
- growing and harvesting methods, Ill. 573.
- grown in Henderson Co., analyses, Ky 100.
- growth, concentrations of essential mineral elements for, Mo. 32.
- growth, effect of B on, Ky. 792.

Soybean(s)—Continued.

- growth, reproduction, and composition, effects of Ba and Sr, Fla. 799.
 - hay yield, planting rate as factor, Miss. 366.
 - improvement, role of hybridization in, 52.
 - Fe-Mn ratio in relation to respiratory CO₂ and deficiency-toxicity symptoms in, 782.
 - iron utilization, differences in efficiency, Iowa 212.
 - lecithoprotein as ice cream emulsifier, Ind. 704.
 - meal and pasture with corn for pigs, Mich. 836.
 - meal as protein source for chicks, Miss. 702.
 - meal in poultry rations, Wash. 404.
 - Mukden and Kanro, adaptation studies, Iowa, 212.
 - nodulation, effect of seed treatment, 666.
 - nodulation, factors affecting, Ill. 504.
 - nodulation in Arizona soils, Ariz. 768.
 - oil, glycerides of, fractionation, Ind. 616.
 - oil meal in broiler rations, value, Mo. 261.
 - oil, nonbreak, production, Ind. 616.
 - oil, nonfat constituents, Ind. 616.
 - photoperiodism and enzyme activity, Mo. 32.
 - place in New Jersey farming, N.J. 366.
 - planting tests, Ind. 659.
 - plants, inoculated and uninoculated, effect of aeration and soil temperature, 777.
 - production, Mo. 666, Nebr. 370.
 - production goals for war needs, Miss. 213.
 - protein, resume and bibliography, U.S.D.A., 618.
 - root structure, effect of root media, Mass. 775.
 - roots and tops, effects of seed weight, 52.
 - seed, chemical composition, factors affecting, Mo. 53.
 - seed, composition, factors affecting, U.S.D.A. 510.
 - seed germination, effect of low temperatures, 512.
 - seed, weak, cause of crop failures, N.Y. State 798.
 - use for silage, Ill. 562.
 - varieties, response to rate and date of planting, Iowa 213.
 - variety tests, Ariz. 791, Ill. 504, Iowa 212, Ky. 792, Me. 213, Mo. 52, N.J. 366, N.Mex. 366, P.R.U. 213, Pa. 504, S.C. 367, S.Dak. 504, Tenn. 367, Wash. 367, Wyo. 793.
 - vitality, effect of storage, Ill. 504.
 - yellow-seeded, variety tests, Del. 212.
 - yields, effect of hailstorms, Ill. 504.
- Spalangia* sp. shipment to Colombia for control of hornfly of cattle, P.R. 695.
- Sparganothis sulfureana* control, 401.

- Species**—
 concept and biosystematy, 32.
 origin of, and genetics, 43.
Spectrophotometer, photoelectric, improvements in, Ind. 616.
Spelt in Michigan, Mich. 217.
Spergon—
 as seed disinfectant, U.S.D.A. 66.
 for sweetpotato treatment, U.S.D.A. 680.
 fungicidal value, U.S.D.A. 377.
 wettable, as disinfectant of seed sweetpotatoes, U.S.D.A. 528.
Sperm—
 mamalian, X-radiation of, effect on embryo, 655.
 respiration rate, effect of cell concentration, 500.
 respiration rate, effect of pH, 500.
Spermatogenesis and sperm morphology in the ram, Mo. 47.
Spermatozoa—
 bull, resistance to unfavorable environment, 209.
 bull, staining affinity, 209.
 live and dead, differentiation, staining method for, 500.
 production by fowls, effect of temperature and season, Ind. 656.
 survival in genital tract of mare, 500.
Sphaceloma—
arachidis, notes, 235.
australis, parasite of mandarin oranges, control, 542.
 cause of severe poinsettia disease, 244.
Sphacelotheca—
n.spp., description, 381.
sorghastri n.sp., description, 536.
Sphaeria, taxonomic data, 487.
Sphaeronema, taxonomic data, 487.
Sphaeropsis *malorum*, notes, 229.
 Spider, red, *see* Red spider.
Spinach—
 culture tests, Fla. 799.
 New Zealand, germination, 513.
 rate and course of respiration in, [N.Y.] Cornell, 33.
 seed treatments recommended for, N.Y. State 222.
 variety tests, Fla. 799.
 wilt resistant variety, developing, 67.
Spinal fluid, nicotinamide in, bacterial assay method, 480.
Spittle bug, notes, Del. 245.
Sponge, vegetable, descriptive account, P.R.U. 800.
 Spore resistance to heat, significance of incubation temperature, 34.
 Spore suspension, stabilized, for disinfection tests, 34.
Spray(s)—*see also* Fungicide(s), Insecticides, and specific forms.
 copper, *see* Copper.
 coverages, nature and effectiveness, Wash. 393.
 dynamite, Pa. 546.
 eradicator, tests, Tenn. 378.
Spray(s)—Continued.
 injury, factors affecting, Wash. 372.
 machinery for home orchards, gardens, and truck crops, Miss. 728, 863.
 material(s)—
 improved, from study of residue, Pa. 479.
 saving for war effort, 531.
 shortage, meeting, Conn.[New Haven] 231.
 nonpoisonous, [N.Y.] Cornell, 90.
 oil, *see* Oil sprays.
 on soil, effect, N.J. 342.
 residue problem, Mass. 820.
 residue removal, Wash. 372.
 residue removal, experiments and trends, 395.
 residues on apples, Ind. 668.
 timing for apple maggot control, N.Y. State 256.
Spraying—
 equipment for pest control, Calif. 581.
 plants, stationary v. portable, power consumption and costs, Ind. 725.
Spruce—
 and fir forests, selective cutting for, Mich. 226.
 cleaning in cut-over hardwood stands, 65.
 sawfly, European, disease of, U.S.D.A. 88.
 sawfly, European, studies, 395.
Spurge, leafy, control by sheep, N.Dak. 700.
Squash—
 bugs, control impractical on low-value crops, Ill. 546.
 responses to boron, 354.
 stored, causes and control of decay in, Mass. 807.
 summer, hybrid, breeding, Conn.[New Haven] 799.
 vine borer, studies, Conn.[New Haven] 822, Mass. 820.
 wilt prevalence and resistance of Table Queen variety to, Wis. 528.
Squirrel(s)—
 damage to conifers, 545.
 ground, pale variation in, 656.
 in southeast Texas, helminths of, 419.
 western fox, ecology and management, Iowa 245.
 western fox, inventory methods applicable to, 545.
Stablefly, transmission of equine infectious anemia by, 718.
Stagonospora subseriata, notes, 72.
Stain(s)—
 for differentiating adult or embryonic bone and cartilage, 629.
 polychrome methylene blue, studies, 629.
 reaction with bacteria, 630.
 standardization, cooperation among Americas, 205.
Staining—
 of bacteria and yeasts with acid dyes, 630.
 Romanowsky, with buffered solutions, 629.

- Staphylococci**—
 of mastitis, bacteriophages for, isolation and characteristics, 421.
 pathogenicity, slide agglutination to determine, 112.
- Staphylococcus**—
aureus, lethal effect of drier rolls on, 348.
 nucleus in cell of, demonstration, 349.
- Starch(es)**—
 characteristics, elasticity and viscosity, Iowa 165.
 consistency and microscopical properties, 348.
 determination, methods, 335.
 determination with sodium hypochlorite, 336.
 electrical studies, Iowa 165.
 in sausage and other meat products, determination, 336.
 in sweetpotatoes, determination by A. O. A. C. malt-disease method, 176.
 oxidized, methylation and hydrolysis, Iowa 165.
 physicochemical properties, Mass. 760.
 Raman spectra, Iowa 165.
 sodium, methylation, Iowa 165.
 synthesis by vegetable cell, role of invertase in, 780.
 X-ray and microscopic studies, Iowa 165.
- Statistics**, graphic correlation procedure, relation to least squares, U.S.D.A. 283.
- Steaks**—
 frozen, drip and evaporation losses, Idaho 739.
 paper in which to wrap, Wash. 404.
- Steers**—*see also* Cattle, beef.
 alfalfa-molasses silage v. alfalfa hay for, Ky. 834.
 Brahman and Angus, as feeder cattle, Fla. 833.
 carcass quality in, judging, Ariz. 835.
 fattening—
 comparison of corn, cane, and millet for, S.Dak. 554.
 kudzu and peanut hays for, Fla. 833.
 molasses for, Fla. 833.
 on linseed meal and oil, factors responsible for finish, Iowa 257.
 on winter pastures with supplemental feeding, Fla. 833.
 feeding on corn-cob-shuck-meal with and without cottonseed meal, Tenn. 404.
 feeding with sugar beet tops, molasses, and beet pulp, Idaho 697.
 grazing, forage intake, fecal dry matter as index, 258.
 Hereford, finish and quality, factors affecting, Fla. 833.
 medium, good, and choice, indexes of returns per bushel of corn fed to, Ill. 583.
 selenized, glutathione and thionelne isolation from blood, 421.
 wet beet pulp v. silage for, Wyo. 834.
 wintered with and without grain, summer gains, Tenn. 404.
- Steers**—Continued.
 yearling, fattening, dehydrated sweet-potatoes for, Tenn. 404.
 yearling, fattening, protein supplements for, comparison, [N.Y.] Cornell 99.
 yearlong grazing in northern Great Plains, U.S.D.A. 258.
- Stegasta dosqueella*, micro leaf worm on peanuts, 247.
- Stemphyllum**—
botryosum *tragopogoni* n.var., notes, 79.
sarcinaeforme from red clover seed, 683.
Stephanurus dentatus, control in hogs, 116.
- Stercum**—
frustulosum on sprout oak stands, U.S. D.A. 83.
gausapatum causing butt rot in young sprout oaks, U.S.D.A. 83.
gausapatum nitrogen metabolism, 808.
rugosiusculum on sweet gum, tupelo, and black gum, U.S.D.A. 680.
- Sterility**—
 in cattle, hormones for combating, [N.Y.] Cornell 47.
 in mice and chromosome breakage, 863.
 somatoplastic, as function of endosperm genotype, 206.
- Sterilizer**, multiple-baffle electric, performances of, 865.
- Sterols**—
 activated, as vitamin D supplements for poultry, Idaho 697.
 activated large doses of, effect on serum calcium, 310.
 derivatives, production and role in nutrition, Iowa 165.
- Sticktight flea**, transmission of endemic typhus fever by, 96.
- Stilboestrol**—
 and oestrone, comparative effects on rat pituitary, 655.
 biological assay, 50.
 potency in immature female rats, 502.
- Stinkbug**, Say, studies, N.Mex. 893.
- Stipa lepida*, diploid and autotetraploid, comparative growth rates, 31.
- Stock (flower)**—
 bacterial disease, cause, 244.
 bacterial blight control by hot-water seed treatment, Calif. 692.
 black rot, 389.
- Stock**, *see* Livestock.
- Stock foods**, *see* Feeding stuffs.
- Stomach worm**—
 eastern, in sheep on irrigated pastures, Oreg. 856.
 in lambs and relation to gastric hemorrhage and general pathology, 716.
 length of life in calf, 422.
 outbreak and control, Ariz. 850.
- Stomatal movements**, recording, inexpensive manometer for, 32.
- Stomoxys calcitrans*, *see* Stablefly.
- Stone**, cast, proposed specification for, 577.
- Storage**, frozen, for farms, Idaho 725.
- Storage studies**, Ind. 668.

- Stoves, pressure gasoline and pressure kerosene, analysis, Nebr. 897.
- Straw, baling, with pick-up baler, 863.
- Strawberry (ies)—
- aphid, migration, 251.
 - black root-tolerant selections, testing, Tenn. 378.
 - breeding, Conn. [New Haven] 799, Tenn. 371, Wash. 372.
 - bud nematode, calcium cyanamide for, Fla. 806.
 - composition, Tenn. 327.
 - crown borer control with methyl bromide, 396.
 - crown borer, methyl bromide fumigation for, Ky. 822.
 - cultural tests, Iowa 220.
 - culture, U.S.D.A. 224.
 - fertilization, N.J. 371.
 - fertilizer tests, Iowa 220.
 - for home garden, N.J. 520.
 - fruit, developmental studies, 31.
 - insects, control, Mo. 85.
 - insects, life history and control, Wash. 92.
 - irrigation studies, Iowa 220.
 - leaf roll, a new disease, 816.
 - leaf spot, cause, P.R.U. 229.
 - plant, growth and composition, effect of source of N and pH of nutrient medium, N.J. 63.
 - poultry manure for fertilizing, Del. 220.
 - production, factors affecting, Iowa 673.
 - production in Ohio, Ohio 63.
 - red stem disease—
 - breeding for resistance, Ill. 516.
 - control, Del. 227.
 - on Pathfinder and Aberdeen varieties, U.S.D.A. 680.
 - promising resistant crosses, 241.
 - "running out" diseases, Wash. 378.
 - spring dwarf situation on Cape Cod, U.S.D.A. 680.
 - transpiration, effect of root temperature, 520.
 - varieties, inheritance of characteristics in, 520.
 - variety tests, Iowa 220, P.R.U. 221.
 - virus diseases, 541.
 - weevil, barium fluosilicate and cryolite against, Del. 245.
 - weevil, dusting for control, 303.
- Stream flow—
- measurements in Colorado River, Snake River, and Pacific slope basins, 725.
 - open-channel, profile curves for, 574.
- Streptococci—
- hemolytic, additional growth factor needed by, 420.
 - hydrolysis of arginine by, [N.Y.]Cornell 83.
 - isolation, sodium azide for, 179.
 - lactic acid fermentation of, 776.
 - mastitis, dehydrogenase systems of, [N.Y.]Cornell 33.
 - mastitis, variability, [N.Y.]Cornell 109.
- Streptococci—Continued.
- of group B, variability in, 420.
 - of Lancefield's group B or C in milk samples, detection, 714.
 - of Lancefield's group C, fibrinolytic properties, 420.
 - respiratory mechanisms, [N.Y.]Cornell 83.
 - riboflavin reduction by, [N.Y.]Cornell 33.
 - synthesis of polysaccharides by, [N.Y.]Cornell 33.
- Streptococcus*—
- agalactiae*—
- eradication from bovine mammary gland, 421.
 - examination of nose, throat, and vaginal swabs from cows and of dung samples for, 566.
 - in udders of heifers at parturition, 422.
 - in various plating media, growth, 106.
- fecalis*, morphological study, 35.
- lactis*, aging without reproduction and viability of young cells, 776.
- lactis tardus* in Virginia milk, effect on quality, 413.
- thermophilus*, growth factors, 180.
- Streptothricin, new selective bacteriostatic and bactericidal agent, 348.
- Strongyles in horses, control, [N.Y.]Cornell 109.
- Strongyloides*—
- in dogs, diagnosis, 274.
- papillosa* in sheep on irrigated pastures, Oreg. 856.
- robustus* n.sp. in squirrels, 419.
- Strongylus vulgaris* tests with organic copper salts, 420.
- Stylopaga cephalote*, notes, 530.
- Succinic acid—
- as metabolite in plant tissues, 168.
 - synthesized by heterotrophic bacteria, position of carbon dioxide in, 168.
- Sucrose, rate of inversion, 175.
- Sudan grass—
- and soybean mixtures, tests, Ariz. 791.
 - culture tests, Wyo. 793.
 - fertilizer tests, Wyo. 793.
 - grazing value, Tenn. 367.
 - leaves, protein-nitrogen, protein-sulfur, and chlorophyll in, relations, 203.
 - new hybrid variety for Southeast, 535.
 - pastures, yield and composition, Ariz. 841.
 - single plants, determining hydrocyanic acid content, 479.
 - trace elements in, 52.
- Sugar beet(s)—
- aphids affecting, 394.
 - black root control, Wash. 378.
 - boron deficiency in, borax spray or dust for control, Wis. 528.
 - breeding, N.Mex. 366.
 - costs and management in irrigated areas, Nebr. 868.

Sugar beet(s)—Continued.

- culture in intermountain area with curly top-resistant varieties, U.S.D.A. 795.
- culture tests, Wyo. 793.
- curly top control, U.S.D.A. 796.
- curly top resistance, testing for, N.Mex. 378.
- diseases in Georgian S. S. R., 529.
- fall-planted, *Phoma* infection, U.S.D.A. 377.
- fertilizer tests, N.Mex. 366, Wyo. 793.
- grown for seed, insects affecting, 394.
- insects, N.Dak. 248.
- irrigation, tests of time and amount, Wash. 367.
- leaf eating pests, excluding grasshoppers, life history and control, 394.
- leafhopper, *see* Beet leafhopper.
- molasses, vitamin deficiencies in, Utah 259.
- nitrogen requirement, Colo. 217.
- rate of planting tests, Iowa 213.
- Savoy disease in Ontario, 236.
- seed production, effect of *Lygus* spp. and control, U.S.D.A. 88.
- seed production, studies, Ariz. 791, N.Mex. 366.
- seed treatments with plant hormones, Mich. 194.
- seedling diseases in Montana, control, 536.
- soil condition in relation to, 161.
- sugar percentage in during harvest, Iowa 213.
- variety tests, N.Mex. 366.
- violet root rot of, U.S.D.A. 377.
- Sugar bush, experimental, operation, N.Y. State 180.
- Sugarcane—**
 - aphid, yellow, predator of, shipment to Louisiana, P.R. 695.
 - beetle on rice, U.S.D.A. 91.
 - beetle, pest of young corn, rice, and strawberry, Ark. 252.
 - borer, biological control, developments in, 89.
 - borer, biological control in Florida Everglades, 95.
 - borer, control, U.S.D.A. 88.
 - borer, control by egg parasites, P.R.U. 248.
 - borer on rice, U.S.D.A. 91.
 - borer parasite, biology, P.R. 255.
 - borer parasite liberations at Guayama, P.R. 695.
 - borer, parasites in São Paulo, Brazil, collection, 89.
 - borer, prevalence and control, Fla. 822.
 - borer survival, effect of burning, U.S.D.A. 88.
 - breeding, Fla. 791, P.R.U. 213.
 - chlorosis, fertilizers for control, P.R.U. 229.
 - chlorotic streak, transmission, 93, U.S.D.A. 88.

Sugarcane—Continued.

- culture tests, P.R.U. 213.
- diseases, 67.
- diseases in Pernambuco, 535.
- fertilizer tests, Fla. 791, P.R.U. 213.
- guide for fertilizing and irrigating, 3.
- hot water treatment, La. 75.
- internal moisture relations and moisture index, 490.
- irrigation tests, P.R.U. 213.
- juice, native, utilization in fermentation industries, P.R.U. 165.
- land, ditcher for use on, P.R. 725.
- leaf-sheath, development of vascular connections in, 31, 651.
- mite, West Indian, eradication, U.S.D.A. 88.
- mosaic determination and types, P.R.U. 229.
- photosynthesis in leaves of, 356.
- physiology of blooming and depth of water table, Fla. 792.
- planting and ratooning equipment, developments in, 280.
- plants grown in deficient nutrient solutions, composition, 218.
- respiratory system, effect of heating at 52° C., 32.
- Sclerospora sacchari* mildew, 230.
- sirup, increased importance as sugar substitute, Miss. 740.
- utilization of P and K, effects of breeding, Fla. 792.
- varieties for animal feed, P.R.U. 213.
- variety Mayaguez 338, susceptibility to pokkah boeng disease, P.R. 680.
- variety tests, Fla. 791, P.R. 666, P.R.U. 213.
- variety tests, high sirup yields in, Miss. 213.
- yields and composition, factors affecting, 218.
- Sugar(s)—*see also* Dextrose, Glucose, Lactose, Sucrose, etc.**
 - Act of 1937, amended, U.S.D.A. 437.
 - and sugar products, lead in, determination, 476.
 - concentration and metabolism in ram semen, Mo. 210.
 - for animal feed, denaturing with octoacetylsaccharose, 405.
 - maple, *see* Maple.
 - preserving and germicidal action on yeasts and bacteria, 763.
 - production in Hawaii, use of Graver continuous clarifier, 281.
 - Raman spectra, Iowa 165.
 - reducing, errors of Munson-Walker tables and precision of method, 175.
 - reducing, Munson-Walker values, redetermination, 175.
 - reducing, rapid determination, 175.
 - thermophile bacteria in, determination, 485.

Sulfanilamide—

- and its derivatives, mode of action, 271.
- curative action in mice, inhibiting effect of various compounds, 853.
- determination in blood, new simple method, 838.
- group of drugs, review, 564.
- percutaneous use in animals and men, 710.
- toxicity, effect of diet, 271.
- wound treatment with, 112.

Sulfanilylguanidine, effect on *Brucella abortus* in vitro, 710.

Sulfapyridine, curative action in mice, inhibiting effect of various compounds, 853

Sulfate recovery studies, Tenn. 342.

Sulfathiazole—

- effect on rabbit tissue, 564.
- use in small animal practice, 271.
- wound treatment with, 112.

Sulfathiazoline, effect on rabbit tissue, 564.

Sulfite liquor from wood pulp industry, effect on soil properties and plant growth, 347.

Sulfonamide drugs, antibacterial action, 271.

Sulfur(s)—

- and sulfur compounds, relation to insect pest control, [N.Y.] Cornell 90.
- bacterium, isolation and identification from an industrial process, 34.
- commercial insecticidal, average particle diameters, 306.
- compounds, experimental use for prevention of cecal coccidiosis, 119.
- determination, accuracy and precision of methods, 478.
- dioxide detection from mixtures of carbonates and sulfites, 177.
- dioxide, effect on titration of ascorbic acid in citrus fruit juices, 481.
- oxidation by *Thiobacillus thiooxidans*, significance of fat in, 193.
- sprays, increasing efficiency, Wash. 393.

Sun and atmosphere, 22.

Sunflower(s)—

- for seed, planting tests, Mass. 793.
- production tests, P.R.U. 213.

Superfetation in mouse, 363.

Superphosphate(s)—

- downward movement, relation to pasture fertilization, 641.
- removal of fluorine from, 345.

Swallows, North American, life history, 545.

Swans, food plants, value, propagation and management, 86.

Swedes and wild turnip, distinguishing seeds of, Wis. 505.

Sweet corn—

- bacterial wilt and smut, U.S.D.A. 680.
- breeding, Fla. 791, Ill. 514, Ind. 668.
- Mass. 800, Me. 220.
- culture, N.J. 371.
- fertilizers for, Wis. 513.
- genetics studies, Iowa 208.
- hybrid, breeding, Conn.[New Haven] 799.
- S.Dak. 513.
- hybrid varieties, value, Wis. 513.

Sweet corn—Continued.

- hybrids for New Jersey, N.J. 371.
- hybrids, spacing, relation to yield and development, N.Y.State 58.
- hybrids, testing, Mass. 800, Pa. 513.
- improvement, Tenn. 372.
- origin, 669.
- production, P.R. 668.
- seed treatments recommended for, N.Y. State 222.
- smut, varietal susceptibility to, N.J. 378.
- spacing, effect on yield, ear size, and other characters, 58.
- variety tests, Iowa 220.
- wilt and smut tests, N.J. 815.
- yield, effect of stand of plants, Ill. 514.
- yield, relation to distance and rate of planting, Ill. 514.

Sweetclover—

- as intercrop in corn and oats rotation, Ind. 659.
- biennial, responses to temperature, moisture, and day length, 31.
- bitter and nonbitter, crossing, Wis. 504.
- breeding, Iowa 212, Wash. 367.
- harvesting for hay v. intercropping, Ind. 659.
- Madrid, a new crop, 792.
- of low coumarin content, breeding for, 1.
- variety tests, Iowa 212, Wash. 367.
- weevil, N.Dak. 832.
- wilt or wilting, 229.

Sweetpotato(es)—

- breeding, Iowa 212, Tenn. 367.
- cull, for livestock feed, dehydration, 433.
- dehydrated, for fattening steers, Tenn. 404.
- diseases in Georgian S. S. R., 529.
- diseases in North Carolina, U.S.D.A. 66.
- fertilizer tests, Del. 212, Fla. 769, Iowa 213, N.J. 366.
- fire-heated hotbeds, S.C., 367, 428.
- irrigation tests, Iowa 213.
- Java black rot in Georgian S. S. R., 529.
- keeping quality, relation to time of digging, N.J. 366.
- meal v. corn for finishing calves, Miss. 835.
- Nancy Hall strain selected for color of flesh, Tenn. 666.
- nutrient absorption by, effect of fertilizer placement, Del. 212.
- plant production, electricity in, S.C. 367.
- Porto Rico, improvement, S.C. 367.
- pox, N.J. 813.
- production for starch or feed purposes, La. 796.
- Rhizopus* soft rot, losses from and control, N.J. 377.
- scurf, black rot, and stem rot similarities and control, N.J. 686.
- scurf control and chloranil, U.S.D.A. 377.
- seed stock, disease-free, propagation, Iowa 228.
- starch, fertilizers for, Miss. 370.

Sweetpotato(es)—Continued.

- starch in, determination by A. O. A. C. malt-diastase method, 176.
- storage house construction, effect of electric heating systems on, 125.
- storage quality, fertilizer and varietal factors in, Iowa 213.
- storage tests, Fla. 760.
- variety tests, Iowa 212, P.R.U. 213, Tenn. 367.
- weevil control and eradication, U.S.D.A. 88.
- wilt control, Del. 227.
- yields, relation to times of planting and digging, N.J. 366.

Swine—see also Pig(s) and Sows.

- arthritis, Wash. 418.
- Breeding Laboratory, regional, organization and development, 208.
- chromosome counts, Mo. 47.
- Duroc-Jersey and Poland China, reciprocal crosses, Mo. 47.
- Duroc-Jersey, inheritance, Mo. 47.
- erysipelas, chronic, control, 273, Idaho 709.
- erysipelas in turkeys, treatment, 119.
- Poland China, inbred lines, improvement, Mo. 47.

Sycamore plant bug control, 397.

Sylvatic plague vectors in North America, 89.

Symphyliid(s)—

control, 391.

greenhouse, relation to dry soil, Pa. 546.

Synopsis and chiasmotypy, present status, 31.

Synohytrium endobioticum studies, 236.

Tabanids, unusual larval habitats, 90.

Tabanus sulcifrons, transmission of equine infectious anemia by, 718.*Taeniothrips simplex*, see Gladiolus thrips.

Tamarisk tree and its wood, Ariz. 859.

Tannins, determination, 338.

Tapeworm, fowl, removal by short periods of starvation, 571.

Tariffs, quantity incidence on competing products, U.S.D.A. 289.

Tarnished plant bug, effect on sugar beet seed production and control, U.S.D.A. 88.

Taro leafhopper, control with egg-sucking bug, 89.

Tarsonemus—

bancrofti, eradication, U.S.D.A. 88.

pallidus, see Cyclamen mite.

Tartar emetic sprays, sugar substitute in, 396.

Tax(es)—

- and governmental costs in rural New York, [N.Y.]Cornell 130.
- assessment procedure and problems, S.Dak. 439.
- collections, State, and allocations by parishes, La. 289.
- delinquency on rural real estate, bibliography, U.S.D.A. 288.
- delinquency, relation to land use, N.J. 434.

Taxation in oil-producing areas, Okla. 780.

Taxonomy, experimental—

approached from various standpoints, 485.

with criteria for relationship, 485.

Taxus mealybug, pest of genus *Taxus*, 828.

Tea bush, micro-organisms of and diseases caused by them, 242.

Tea, effect on energy metabolism of children, 888.

Tea fermentation, chemistry of, 192.

Teak defoliators, parasites of, biology, 395.

Teat sphincter, anatomy and physiology, 267.

Teeth—

conditions in childhood, pediatric aspect, 156.

decay and drinking water, 800.

decay, relation to *Lactobacillus acidophilus* in saliva, 890.

developing, in rats on vitamin A-deficient diet, changes in, 600.

dietary repair of experimental caries in, 462.

effect of prolonged vitamin deficiencies, 598.

incisor, of rachitic rats, effect of vitamin D on, 460.

mottled, relation to fluorine in water supply, 163.

mottled, removal of stain from with hydrogen peroxide, Ariz. 760.

mottled, removing brown stain from, 462.

of rats, experimental caries, reduction by fluorine, 598.

substance of, potassium in, spectrochemical studies, 462.

Tennochila virescens chlorodia, predator of mountain pine beetle, 95.

Temperature(s)—see also Climate(s) and Soil temperature.

air, and fruit, relation, 341.

difference, role in ontogenesis of vegetables, 353.

of -12° F. or lower, frequency in thirty winters, Mich. 767.

Tenebroides corticalis predaceous on codling moth larvae, 247.

Tennessee Station report, 465.

Tensiometers, use for observing soil moisture under corn, Iowa, 183.

Tent caterpillar, eastern, Del. 245.

Teosinte and corn, cytogenetic study, Mo. 359.

Tephrosia—

roots, toxic constituents in, relation to carbohydrates, P.R. 617.

virginiana, rotenone-bearing variety in New Jersey, 826.

Termite(s)—

control, 397, Ill. 546.

damage, protection of buildings against, U.S.D.A. 88.

injury, prevention, N.J., 391.

studies, 894.

Terrace(s)—

- dependence of efficiency on maintenance, Ill. 573.
- grades on Shelby soil, relation to soil and water losses, 861.
- old farmer-built, studies, 430.

Terracing—

- place in soil erosion control, N.J. 342.
- practices, test, 187.

Terrapin scale control with insecticides, 395.

Testis reaction to synthetic androgens, 655.

Testold compounds, morphogenetic actions, differences between, 654.

Testosterone—

- effect on responsiveness of immature gonad to chorionic gonadotropin, 51.
- propionate, effect in spayed female rats, 658.

1,4,5,7-Tetrahydroxy-2-methylantraquinone, synthesis of, 349.

Tetranychus spp., see Red spider.

Texas Station—

- notes, 468.
- publications available, list, 899.

Textile—see also (Fabric(s)).

- fabrics and their selection, 752.
- materials, cross sectioning by hand, 157.
- materials, nonmetallic, new and revised standards, 156.
- materials used for household purposes by farm families, S.C. 608.
- photomicrographs made at low power by fluorescent light, 752.
- research, Pa. 607.
- research aid, air permeability, instrument, 753.
- tests, application of rank correlation to development of methods, 462.

Thamnopydes n.spp. and biology, 546.

Theresia olaripalpis—

- liberations at Guayama, P.R. 595.
- parasite of *Diatraea* spp. in Trinidad, 552.

Thermocouples, tube-wall, method of installing, 171.

Thermogenesis, microbial, Iowa 183.

Thiamin—see also Vitamin B₁.

- and growth of *Pythium*, 351.
- and its degradation products in man, excretion, 894.
- and riboflavin in food products, combined determination, 10.
- and riboflavin metabolism, 698.
- deficiency and Chastek paralysis in foxes, 858.
- deficiency, effect on citric acid excretion, 815.
- deficiency, effect on fatal pneumococcal infection in mice, 110.
- deficiency in rats, effect on pyruvic acid excretion and bisulfite-binding substances in urine, 315.
- depletion tests, bisulfite binding substances in, 149.
- determination by thiochrome reaction, 9.
- determination in urine, effect of ingestion of nicotinic acid on, 480.
- rate in digestive secretions, 149.

Thiamin—Continued.

- hydrochloride, sensitization to, 608.
- in agar, 89.
- in cereals, thiochrome method of analysis, 9.
- in green snap beans, effect of freezing, canning, and dehydration, 891.
- in human blood and urine, determination, 602.
- in rye and its milled products, 146.
- in soft wheat mill streams, 148.
- in urine, estimation, 620.
- in wheat and corn, 148.
- in wheat milling products and in bread, 604.
- in wheat of different types and grown in different environments, 604.
- in wheat of 1940 crop, 603.
- metabolism in humans and rats, Ariz. 880.
- requirements and environmental temperatures, 602.
- requirements of albino rat, 698.
- requirements of pigs, relation to fat in diet, 98.
- studies on older subjects, 314.
- transport in tomato plant, 488.
- urinary excretion on high fat and high carbohydrate diets, 149.

Thielaviopsis—

- basicola* infection of geranium cuttings, 388.
- paradoxa*, notes, 535.

Thiobacillus thiooxidans, sulfur oxidation by, significance of fat in, 193.

Thistle hoppers, epizootic among, 247.

Thiuram disulfide for turf and for treating seeds, N.J. 810.

Thlaspi arvense seed germination, 512.

Thresher, home-made, for castor-beans, 579.

Thrips—

- control, in greenhouse, U.S.D.A. 88.

predaceous, notes, 397.

Thrips tabaci, see Onion thrips.

Thrombin, purification, 160.

Thurberia weevil control, U.S.D.A. 88.

Thyroid—

- activity, effect of progressive iodination of skim milk and casein on, 267.
- gland of female rats, mitotic activity, 654.
- gland of guinea pig during sexual cycle, proliferative activity, 508.
- iodine in, determination, modified method, 178.

Thyroidectomy, effect on lactation in rat, 105.

Thyrolactin feeding, effect on milk production, 705.

Thyroprotein, artificial, production, 8.

Thyroxin effect on—

- blood sugar and glycogen stores of hypophysectomized rats, 503.
- insulin of rat pancreas, 503.
- milk production, Mo. 103.

Thysanoptera new to island of Midway, 547.

Tick-bite fever, transmission, brown dog tick, 851.

Tick(s)—

- affecting animals, U.S.D.A. 89.
- affecting birds' eyesight, 246.
- affecting man, U.S.D.A. 89.
- coast, problem in British Columbia, 97.
- host immunity to, 90.
- infesting livestock in Southern Rhodesia, 696.
- of Minnesota, 403.
- parasites on Cape Cod, 553.
- winter, ecology, 89.

Tift Sudan, new variety of grass for South-east, 535.

Tilling costs and systems, N.J. 428.

Tillage, subsurface, equipment for, 123.

Tilletia—

- levis*, new races, 71.
- levis* on wheat, new races, Wash. 378.
- new species, description, 381.
- tritici*, new races, 71.
- tritici* on wheat, new races, Wash. 378.

Timber—see also Wood(s).

- structural, anobid beetle damage to, 400.
- volume, rapid and reliable estimates, 804.

Timothy—

- and Ladino clover mixture, methods for ensiling, Me. 264.
- composition of tops and roots at successive growth stages, 473.
- development, effect of soil temperature, 196.
- nitrogen fertilization for, [N.Y.]Cornell 53.

Tissue(s)—

- and slides, convenient washing devices for, 628.
- disintegrator, circular revolving brush as, 331.
- sections, cutting on sliding microtome by "dry ice" method, 559, 627.
- transferring, simple method, 359, 628.

Tlascala finitella, notes, Mass. 820.

Tond, giant, shipment to Cuba, P.R. 695.

Tobacco—

- and products, stored, insects attacking, control, U.S.D.A. 823.
- and tomato, reciprocal grafts, accumulation of nicotine, 201.
- auction markets, organization, Ky. 866.
- bacterial leaf spot infection, sources, Fla. 806.
- bacterial leaf spots, Pa. 686.
- black and brown root rot, Mass. 806.
- "black," chemistry of, Conn.[New Haven] 805.
- black shank and root knot resistant varieties, Fla. 806.
- breeding, Tenn. 387.
- bright, soil factors affecting availability of major elements, Fla. 792.
- broad ring-spot virus, 814.
- brown root rot, factors affecting, Mass. 792.
- budworm on cigar-type tobacco in South, U.S.D.A. 894.

Tobacco—Continued.

burley—

- and dark, curing experiments, Ky. 792.
- growth, fertility v. moisture in, Ky. 792.
- rotations and air-curing tests for, Tenn. 367.
- row-spacing and vitamin B₁ in setting plants, Ky. 792.
- virus disease due to *Plantago major* virus, Fla. 806.
- yield and quality, effect of manure, Ky. 792.
- cigar leaf, experiments, Conn.[New Haven] 706.
- cigar-type, in South, insect pests, U.S.D.A. 394.
- composition, Tenn. 327.
- cost of production, Ind. 729.
- culture tests, Tenn. 367.
- dark, adjustments for loss of income from, Ky. 866.
- diseases, control by development of resistant varieties, Ky. 806.
- diseases, decays, and disorders in Puerto Rico, U.S.D.A. 680.
- diseases in Massachusetts, U.S.D.A. 805.
- diseases, studies, Conn.[New Haven] 813, Tenn. 378.
- downy mildew—
 - control, 237, Fla. 806, S.C. 378.
 - control in seedbeds, Conn.[New Haven] 805.
 - gas treatment for, U.S.D.A. 76.
 - spray for, U.S.D.A. 527.
- farms, improving low incomes on, U.S.D.A. 289.
- farms, small, planning for conservation, N.C. 438.
- fertilizer and manuring experiments, Wis. 505.
- fertilizer placement and relative efficiency of N carriers, Conn.[New Haven] 791.
- fertilizer tests, Ky. 792, Pa. 504, Tenn. 367, Wis. 218.
- flea beetle, insecticides against, laboratory tests, 831.
- flea beetle on cigar-type tobacco in South, U.S.D.A. 394.
- flue-cured—
 - adjustable spray boom for treating, S.C. 378.
 - cold injury to seedlings, 587.
 - diseases in North Carolina, U.S.D.A. 66.
 - production, Fla. 792.
- growers, need of credit and variations in production credit terms, P.R.U. 284.
- hornworm control, U.S.D.A. 88.
- hornworm, median lethal dose of insecticides for, Tenn. 393.
- hornworm, notes, Tenn. 393.
- hornworm on cigar-type tobacco in South, U.S.D.A. 394.

Tobacco—Continued.

insect damage in Connecticut Valley, 248.
irrigation, Conn.[New Haven] 797.

K carriers and rates and improvement
of curing process, S.C. 387.

leaf-curl, new petunia strain, 76.

leaves, invasion by *Phytophthora tabaci*
and *P. angulata*, relation to moisture,
383.

low-grade, search for new uses for, Ky.
764.

moisture in, determination methods, 347.
mosaic and tobacco necrosis viruses,
separation, 77.

mosaic, breeding for resistance to, 230.

mosaic in Ontario and Quebec, 687.

mosaic virus—

active crystalline fraction of, Mo. 87.
analysis for biotin, riboflavin, and
pantothenic acid, 813.

derivatives of, 77.

effect on cellular respiration, 237.

extracted, unpreserved for 28 years,
infectivity, 687.

inactivation by X-rays, effect of pH
on, 814.

liquid crystals of, 813.

protein, cystine in, colorimetric de-
termination, 5.

protein in plant extracts, determina-
tion, 384.

protein, method for assay, 620.

protein particle, size and shape, 237.

reversible inactivation by crystalline
ribonuclease, 237.

specific biological activity, factors
affecting, 814.

strains, aromatic amino acids in, 384.

strains, chemical composition, 77.

strains, variations in cytoplasmic
inclusions induced by, 384.

structure and activity, effects of
iodine and other reagents, 237.

moth—

control, U.S.D.A. 88.

in tobacco warehouses, natural ene-
mies of, 822.

notes, 551.

phosphorus starvation causing leaf spot-
ting, Fla. 806.

plant bed(s)—

diseases in, U.S.D.A. 66, 528.

fertilization, Fla. 792.

green June beetle larvae in, control,
S.C. 393.

plants, enzymatic activities, 536.

plants, healthy and mosaic-infected, res-
piration in, 813.

plants, physiological studies, 797.

production, prices, purchasing power,
consumption, etc., P.R.U. 284.

root knot infestation, reducing, culture
practices for, Fla. 806.

root knot nematode, cultural measures
for control, 238.

rotations, Pa. 504.

Tobacco—Continued.

seed of six varieties, certified, grow-
ing, Wis. 505.

seedbed disease survey in Massachusetts,
U.S.D.A. 680.

seedbed diseases in Maryland, U.S.D.A.
680.

seedbed infection by *Rhizoctonia solani*,
78.

seedbed, soil treatments for damping-
off and weeds in, Mass. 806.

shade, development of improved types,
Conn.[New Haven] 791.

soils, survey, Wis. 184.

thrips, Conn.[New Haven] 822.

United States, trends in demand and
consumption, Ky. 866.

variety tests, Tenn. 867.

Virginia flue-cured, quality, relation to
bacterial flora, 33.

virus disease, possibility of transmitting
by spraying extracts of mosaicked
plants, 77.

warehouses, open-type, fumigation, 823.

wildfire control, Tenn. 378.

wildfire, micro-organism associated with,
Pa. 686.

yield and quality, factors affecting, Mass.
792.

Tolyposporium senegalense and *T. bullatum*,
synonyms, 230.

Tomato(es)—

Alternaria blight, spraying and dusting
for, Tenn. 378.

Alternaria defoliation of, Conn.[New
Haven] 805.

and tobacco, reciprocal grafts, accumu-
lation of nicotine, 201.

blossom-end rot, varietal resistance to,
79.

Bounty, yield, N.Dak. 222, 669.

breeding, Conn.[New Haven] 799, Ill.
514, Mass. 800, Pa. 513.

breeding and selection under local con-
ditions, Fla. 799.

breeding for *Fusarium* wilt resistance,
Ind. 668, Mo. 67.

breeding for resistance to defoliation dis-
eases, Ind. 668.

canned, quality, Ind. 668.

cost of production, P.R.U. 290.

crosses, genetic studies, 45.

crown gall infection, 689.

cultural practices, Ill. 514.

culture, Del. 220, N.J. 371, Okla. 222,
Tenn. 371.

culture in greenhouse, N.J. 669.

curly top, menace to production in Utah,
Utah 239.

curly top resistance in hybrid strain,
Idaho 679.

damping-off of seedlings, control, Pa.
528.

danger in planting on soil infected with
bacterial wilt, N.J. 377.

defoliation, causes, effects, and control,
Conn.[New Haven] 688.

Tomato(es)—Continued.

defoliation control by manganese sulfate spray, U.S.D.A. 527.

defoliation disease, measuring magnitude, 79.

diploids and tetraploids, genetic stability, 653.

diseases, control, Fla. 806.

diseases, important, survey of genus *Lycopersicon* for resistance to, U.S.D.A. 690.

double-hill planting, 2.

fertilizer placement with, Pa. 513.

fruit(s)—

Aphelenchoides ritzema-bosi in, 539.
genetic characters resembling symptoms of disease, 359.

on plant, respiratory and ripening behavior, 493.

response to methyl-bromide fumigation, 60.

set and development, effect of indolebutyric acid, 515.

fruitworm control, Tenn. 393, Wash. 394.

fruitworm studies, S.C. 393.

Fusarium pathogenically variable strains, difference in pH relations, 239.

Fusarium wilt, N.J. 815.

Fusarium wilt resistance, Tenn. 378.

genetics studies, Iowa 208.

greenhouse, effects of mosaic-inducing viruses, 690.

greenhouse, fertilization, Ill. 514.

greenhouse, sources of organic matter for, Mass. 800.

growing, costs and profits, P.R.U. 284.

growth, effect of soil temperature, Mass. 775.

growth, reproduction, and composition, effects of Ba and Sr, Fla. 799.

haploid, diploid, and tetraploid, epidermal patterns in, 191.

late, combined sprays for, 240.

leaf-spot resistant varieties, breeding, Tenn. 371.

leaf spots and fruit rots, spraying for, 229.

Maine-grown varieties, ascorbic acid in, 606.

mulching, Mass. 800.

new fertilizer practices and starter solutions for, 669.

Pan America, yield on *Fusarium* wilt infested soil, 239.

Phytophthora fruit rot, 229.

pigments, effect of external factors, 200.

plant(s)—

approach-grafted, water and nutrient intake, effect of solute concentration, 32.

ascorbic acid content, effect of potassium iodide, Ky. 800.

culture under artificial light, bibliography of, 784.

effect of phenylacetic acid and naphthalene acetamide on, 352.

Tomato(es)—Continued.

plant(s) continued.

effect of topping on fruit set and yield, 223.

hardened with nutrient solutions, growth and yield, 222.

response to α naphthaleneacetamide and phenylacetic acid, 39.

seedling, testing for disease resistance, 539.

set of, effect of growth substances, Mo. 57.

sprayed, as seedlings in Georgia and Ohio, comparison, Ohio 239.

tests as guide to fertilizers, 222.

variety, spacing, and staking, interrelations, 515.

production for canning, Okla. 373.

production for canning and manufacture, U.S.D.A. 373.

production, trends by areas, U.S.D.A. 60.

psyllid, immature stages, effect of insecticides, 250.

puffing, Fla. 799.

Pythium spp. on, Mo. 67.

quality studies, Ind. 668.

research in South, symposium, Tex. 899.

ring spot on currant, 691.

roots, excised, specificity of pyridoxine for, 488.

roots, isolated, reversible growth inhibition, 32.

seed disinfection, injury from, 539.

seed production, Ind. 668.

seed, vernalization, 515.

seedlings, *Alternaria solani* infection of, 386.

selling on graded basis, Ind. 730.

shape index, Mass. 800.

spraying, Ill. 514, Wis. 513.

tip blight in West Virginia, cause, U.S.D.A. 680.

treated with calcium chloride, calcium pectate as tissue-firming compound, 329.

use of starter solutions for, Pa. 513.

vapo-dusting, Fla. 806.

varieties, N.Mex. 371, Wis. 513.

varieties, F_1 combining ability, 653.

variety, new, development, S.Dak. 513.

variety tests, Iowa 220, Mo. 57.

virus diseases, 539.

wilt resistance, development, 539.

Topsoil removal, Mass. 769.

Towels, water absorption by, 464.

Toxemia in sheep, Mo. 108.

Toxoplasma infection in animals, 567.

Trachetis, infectious, in chicken, transmission by contaminated eggshell, 721.

Tractor(s)—

costs of operation, Ind. 729.

costs of operation in 1930 and 1940, Ky. 866.

effects on farming in Minnesota, U.S.D.A. 297.

Tractor(s)—Continued.

- farm, use in Minnesota, U. S. D. A. 97.
- farming, conversion of horse machinery for, S.Dak. 573.
- new life for, rubber tires and high compression as source, Ill. 573.
- release hitch, automatic, adaptation of field gun recoil mechanism principle to, Pa. 573.
- tests of Nebraska, Nebr. 280.

Trade—

- foreign, and agriculture, [N.Y.]Cornell 130.
- foreign, effects of exchange depreciation, [N.Y.]Cornell 876.
- relations, Canada-United States, 582.

Tragopogon dubius response to length of day, 204**Transpiration**—

- from natural surfaces, 632.
- rate of yellow coleus plants, effects of inert dusts, 197.

Tree(s)—

- attacked by root diseases, rejuvenating, 531.
- boron content, 190.
- coniferous, *see* Conifer(s).
- diseases, Mass. 806.
- diseases, studies, importance to national defense, Mass. 806.
- effect of blizzard of 1940 in Iowa, 767.
- evergreen, *see* Evergreen(s).
- forest, growth, effect of fertilizers, [N.Y.]Cornell 65.
- forest, root development, effect of soil types, Conn.[New Haven] 803.
- fruit and ornamental, toadstool root rot of, 542.
- fruits, varieties, N.Mex. 371.
- growth and environmental complex, 803.
- growth, effect of different methods of slash disposal, Conn.[New Haven] 803.
- growth in shelterbelt, effect of fertilizer and culture, S.Dak. 513.
- growth, prairie soil as medium for, 65.
- hardwood—

Fomes fomentarius on, biology, Me. 693.

forest lysimeter studies under, Conn. [New Haven] 575.

intolerant, improvement cuttings in, 65.

native, use for fencing, Conn.[New Haven] 800.

southern, machining and related characteristics, U.S.D.A. 577.

injection methods, 381.

nursery, production for erosion control, 226.

of New Zealand, natural root grafts in, 196.

of Puerto Rico, U.S.D.A. 803.

ornamental, testing, Wash. 372.

planting, use of lime and phosphorus in, Mass. 800.

pruning on home grounds, Miss. 60.

Tree(s)—Continued.

- seeds, viability testing, advances in, 43.
- shade and forest, insects affecting, U.S.D.A. 88.
- shade, damaged, care of, U.S.D.A. 803.
- shade, lightning protection for, 129.
- shelterbelt, *see* Shelterbelt(s).
- species, root distribution in different soils, Conn.[New Haven] 276.
- volume tables for Indiana, Ind. 676.
- wrapping for protection from borers, Ill. 546.

Trefoll, birdsfoot, tests with, [N.Y.]Cornell 53.

Trematostoma, taxonomic data, 487.

Triatoma spp. feeding, reactions of man to, 93.

Tribolium confusum, *see* Flour beetle, confused.

Trichinella spiralis—

- active immunity in mice against, 712.
- immunity to in rat, passive transfer, 712.
- infection in man and animals in New Orleans area, 852.

Trichinosed rats, metabolism during early phase of disease, 421.

Trichinosis, in rat, effect of X-ray, 712.

Trichogramma minutum—

- for control of sugarcane borer, P.R.U. 248.

parasite of sugarcane borer in Florida, 95.

Trichomonas—

foetus, animal inoculations with pure cultures, 713.

foetus in house fly, viability, 392.

foetus in slaughtered cattle, 568.

foetus, infection of cows, 113.

gallinae in birds, studies, 421.

gallinarum in turkeys, fever therapy for control, 426.

vaginalis, animal inoculations with pure cultures, 713.

Trichomoniasis, rare in chickens found in two flocks in State, Ill. 504.

Trichophyton mentagrophytes, notes, 719.

Trichopoda pennipes, parasite of *Anasa tristis*, 402.

Trichosphaeria sacchari, notes, 535.

Trichuris ovis in sheep on irrigated pastures, Oreg. 850.

Trifolium repens, multiple oppositional alleles causing cross-incompatibility in, 206.

Trioxa maura predators, 247.

Triticeinae—

amphidiploids n, Mo. 207.

chromosome pairing and fertility in hybrids, Mo. 207.

Triticum sativum, glandular epithelium of scutellum, cytoplasmic inclusions in, 784.

Tritrichomonas foetus, possible cause of early abortion in herds, Ill. 564.

Tropaeolum majus stem cuttings, development of adventitious roots, 31.

Trousers of wool and part-wool fabrics, wear tests, S.Dak. 608.

Trout—

- management at Great Smoky Mountains National Park, 545.
- nutritional requirements, [N.Y.]Cornell 85.
- streams, closed, overpopulation of, Pa. 546.

Truck crop(s)—

- cooperative marketing, financial results, P.R.U. 294.
- diseases in Massachusetts, U.S.D.A. 805.
- erosion project, Tenn. 342.
- farms, income and profit increase on, Miss. 730.
- fertilizer requirements, Wash. 372.
- grown at different fertility levels, variety tests, Fla. 799.
- insects control with thiocyanate-derbris dusts, 821.
- phenological tests, Fla. 799.
- selection and breeding, Wash. 372.
- spray machinery for, Miss. 863.
- variety tests, Wash. 372.
- virus diseases of, ornamentals as carriers, 238.
- water tables for, Fla. 799.
- yield, factors affecting, 513.

Trucks—

- for hauling livestock, operating costs, charges, and earnings Ill. 583.
- importance in transportation of vegetables, P.R.U. 871.

Trypanidius nocturnus, new beetle from Puerto Rico, P.R.U. 400.

Trypanosoma congolense in cattle, action of aromatic diamidines on, 113.

Tubercle bacilli, bovine, in sputum, 713.

Tuberculin, avian and mammalian, determining sensitizing agent in cattle tested with, 114.

Tuberculosis—

- extrapulmonary, in northern Italy, bone, joint, and cervical lymph node lesions in, 715.
- in Tropics, especially Uganda, 114.

Tularemia, latent feline and human infection, 713.

Tulip(s)—

- bulb production in Upper Peninsula, Mich. 803.
- flower bud formation, time and manner, Iowa 220.
- stem and bulb cutworm new threat to, 389.

Tulipa, critical period for floral initiation in, 191.

Tumors—

- epithelial, of horses, 718.
- genetic resistance to, [N.Y.]Cornell 47.

Tung trees—

- investigations, work of U. S. Field Laboratory for, Fla. 799.
- propagation, planting, and fertilization tests, Fla. 799.
- root development, effect of cultivation and sod treatment, Miss. 376.

Turf—

- bent, from self- and open-pollinated seed and from stolons comparison, 214.
- diseases, thiuram disulfide for, 810.
- fertilizer formulas and relative value of nitrogen sources, [N.Y.]Cornell 53.
- fine, experiments, N.J. 366.
- grasses, plowing, mowing, and cutting, N.J. 366.
- white grub control in, Ind. 604.

Turkey(s)—

- blood protozoan transmitted by *Simulium nigroparvum*, 724.
- breeding and growing, Ind. 698.
- eggs, hatchability, effect of rations, S.Dak. 554.
- eggs, hatchability, effect of temperature, N.Dak. 841.
- eggs, hatchability, relation to relative humidity, Ky. 834.
- fed different grain rations, growth and quality of meat, Wyo. 834.
- flocks, hexamitiasis in, 426.
- nutritional requirements, Mo. 99.
- on range, reduction of feed costs by use of whole oats, Pa. 554.
- poults, choline and mineral requirements, Wash. 404.
- poults, poisoning by whorled milkweed, 572.
- poults, rations for, Wash. 404.
- poults, vitamin D requirements, 562, Wash. 404.
- production, limited range for, 562.
- riboflavin requirement for fertile egg production, Pa. 554.
- sex-linked albinism in, 363.
- sorghums and proso millet for, S.Dak. 554.
- vitamin D requirements, Pa. 554.
- wild, wheat and corn ideal feed for, Pa. 546.

Turnip(s)—

- brown heart, control, 229.
- greens, food value and yield, effect of soils and fertilizers, Miss. 887.
- nutrition of, 535.
- wild, and swedes, distinguishing seeds of, Wis. 505.

Twilight period, photoperiodically effective, length of, 356.

Tylenchus coffeae, host plants of, 817.

Tyloclasma fragariae, see Strawberry crown borer.

Typhlocyba pomaria, see Apple leafhopper, white.

Typhoid, fowl, breeding for resistance to in laboratory animals, Iowa 209.

Typhoidlike diseases, breeding for resistance to in laboratory animals, Iowa 209.

Typhula itoana causing snow mold of grasses, Pa. 528.

Typhus fever, endemic, transmission experiments with sticktight fleas, 96.

Tyrocidine studies, 852.

- Tyrothricin, effect on bacteriophage and bacterial toxins and toxinlike substances, 710.
- Udder—
bovine, suspensory apparatus of, 705.
infection, method of detection, 567.
- Ultraviolet—
absorption of cells, increase during irradiation, 204.
light, effect on equine encephalomyelitis virus protein, 424.
light, use on laying flock, Mich. 262.
- U. S. Department of Agriculture—
Bureau of Entomology and Plant Quarantine, *see* Bureau of Entomology and Plant Quarantine.
landmarks in history, U.S.D.A. 302.
publications and policies covering distribution, U.S.D.A. 159.
- University of Illinois Land Grant Endowment Fund, history, 136.
- Urbanus proteus*, *see* Bean leaf roller.
- Urea—
as partial substitute for protein in dairy rations, Mass. 842.
as source of nitrogen in animal feeding, 3.
as source of protein for chicks, 702.
as supplement for pigs, 406.
hydrolysis in soils, catalytic activity causing, 774.
v. cottonseed meal, tobacco crop-producing capacity, Conn. [New Haven] 796.
- Urdo sapotae*, notes, U.S.D.A. 680.
- Urinary calculi, problem in feed lot meat production, Colo. 851.
- Urine—
human, bisulfite binding substances in, 149.
nicotinamide in, bacterial assay method, 480.
nicotinic acid in, 893.
pantothenic acid in, determination, 338.
riboflavin in, fluorometric determination, 621.
thiamin in, determination, 602, 620.
vitamin B₁ in as determined chemically and biologically, 763.
vitamin C determination in, 623.
- Urocystis gladioli* and *Papulaspora gladioli*, morphological distinction, 381.
- Uronic groups in soil and plant material, determination, 5.
- Ustilaginales of world, studies, 381.
- Ustilago*—
acneae and *U. perennans*, identity, Wash. 378.
n.spp., description, 381.
nuda in barley, resistance inheritance to, Mo. 67.
scitaminea, new to Argentina, 230.
zeae, inbred strains, Mo. 67.
- Utah College notes, 612.
- Utah Station notes, 612.
- Uterine extracts from rabbits during pregnancy, toxicity, 501.
- Uterus—
and corpus luteum, relation, [N.Y.] Cornell 47.
weight response to chorionic gonadotrophin, 655.
- Vaccinia virus in sheep, neurotropic strain, experimental production, 115.
- Vaginal opening in young rats, effect of lactogenic preparations, 266.
- Valonia cell wall, formation and orientation of crystalline cellulose in, 43.
- Vanadium absorption and excretion by man, 748.
- Vanilla—
bean research, P.R. 616.
blast disease, P.R. 679.
extract, phenols in, determination and significance, 337.
hold-fast roots, limited capacity to utilize nutrients, P.R. 680.
production, limiting factors in, P.R. 679.
- Vapor—
sorption apparatus, improved compact six-tube, 170.
thermoregulator, adjustable, 171.
- Veal, nicotinic acid in, 150.
- Vegetable(s)—
adaptability for freezing preservation, Tenn. 372.
adaptation tests in Yuma Mesa, Ariz. 798.
adaptability in Wichita Valley, Tex. 372.
and fruit auction markets, farmers' country, operation, [N.Y.] Cornell 129.
breeding for quality improvement, Mass. 800.
canned, firmness, Ky. 884.
canned, nutritive value, effect of canning, 446.
canning, Wash. 451.
carotenoid pigments and content, Ind. 616.
chemical composition and places in peacetime and wartime diets, 446.
cooking quality, chemical changes in, Mass. 760.
cooperative canning, U.S.D.A. 295.
cooperatives in Michigan, Mich. 874.
crops, land utilization for, [N.Y.] Cornell 58.
crops, secondary element requirements and deficiency symptoms, Fla. 768.
culture with fertilizer in water, N.J. 669.
dehydrated, effect of blanching, 590.
dehydration rates, effect of blanching, 752.
diseases—
control with fixed copper compounds, 78.
in North Carolina, U.S.D.A. 66.
in Pennsylvania, U.S.D.A. 880.
problems on Long Island, N.Y. State 815.
seed and seedbed treatments, Fla. 806.
studies, U.S.D.A. 805.

Vegetable(s)—Continued.

dried and dehydrated, nutritive value, N.Y.State 450.
 dried, ascorbic acid in, 751.
 drying for home use, Utah 741.
 early forcing, chemical soil-surface treatments in hotbeds for damping-off, Mass. 807.
 economy of production in home garden, Iowa 321.
 effect of cooking on nutritive value, 589.
 fertilization, N.Y.State 801.
 fertilizer requirements on Long Island, [N.Y.]Cornell 58.
 fertilizer tests, N.J. 371.
 fertilizing, economy of, relation to irrigation, Pa. 513.
 Florida, pilloilm wrappers for, Fla. 372.
 for commercial production, varieties and strains, Fla. 799.
 freezing, Ind. 668.
 freezing preservation, Iowa 220, N.Y. State 801.
 frozen, research on, 885.
 frozen, tissue of, microscopic studies, 885.
 gardening, *see* Garden(s).
 greens, marketing, U.S.D.A. 440.
 growers, soil management practices for, 668.
 growing in Bristol County, Mass. 866.
 grown on muck soils, production and marketing, Ind. 668.
 growth and yield, relation to soil reaction, Fla. 799.
 growth, yield, and quality, effect of green manure crops, Fla. 799.
 handling and storage, [N.Y.]Cornell 130.
 importance of trucks in transportation, P.R.U. 871.
 insects destructive to, P.R.U. 824.
 insects studies, 394.
 internal atmosphere, simultaneous measurement of CO₂ and volatiles in, Mo. 57.
 juices, fresh and canned, vitamin C in, comparative costs, 457.
 kind and variety for freezing, S.Dak. 590.
 leafy, distribution of minerals and vitamins in, 144.
 locker freezing, Wash. 139.
 marketing—
 and cost of distribution in cities of San Juan and Rio Piedras, P.R.U. 870.
 bibliography, U.S.D.A. 440.
 cooperatives, P.R.U. 284.
 marketing problems, Utah 733.
 minerals in, relation to soils in which grown, Ariz. 380.
 of Costa Rica, vitamin C in, 458.
 of Florida, insects and other pests, Fla. 823.
 of Florida, vitamin C in, Fla. 880.
 of India, proximate constituents and Ca and P in, 589.
 oils, *see* Oil(s).

Vegetable(s)—Continued.

on muck soils, [N.Y.]Cornell 58.
 on sandy soils, *lad.* 668.
 ontogenesis of, role of temperature difference, 353.
 packaging for upstate New York markets, [N.Y.]Cornell 585.
 preparing for refrigerated locker storage, Okla. 741.
 preservation by freezing in refrigerated locker plants, Iowa 885.
 preservation, methods available for, Miss. 741.
 production, deep tillage and lime in, value, N.J. 371.
 production, limits in use of borax in, 514.
 production, vitamins and growth substances in, [N.Y.]Cornell 58.
 products, studies, Wash. 327.
 rate and course of respiration in, [N.Y.]Cornell 33.
 refrigerated locker storage of, Iowa 303.
 relation to human nutrition in wartime, 884.
 respiration rate and respiratory quotient, effect of temperature, 668.
 response to different nitrogen carriers, 221.
 retailers' gross margins on, P.R.U. 284.
 seed and seedlings, causes of failure in various Florida soils and prevention, Fla. 806.
 seed conservation, N.J. 371.
 seed for retail sale, purity, germination, and yield, Ohio 801.
 seed production, Ariz. 798.
 seed, storage, U.S.D.A. 514.
 seed treatments—
 for damping-off control, Mass. 807.
 methods and materials, Miss. 382.
 recommended for, N.Y.State 222.
 studies, Miss. 681, U.S.D.A. 238.
 soil maintenance for, Conn.[New Haven] 768.
 soil reaction for, [N.Y.]Cornell 23.
 spring, benefited by nitrate treatment, Miss. 221.
 storage and preservation with pilloilm, ultraviolet light, and brine, Fla. 760.
 use of starter solutions for, N.Y.State 801.
 varieties, adaptability, effect of mineral deficiencies, Fla. 799.
 varieties and strains, [N.Y.]Cornell 58.
 varieties for Delta gardens, Miss. 669.
 varieties suitable for Wyoming culture, Wyo. 373.
 variety tests, Ariz. 798, Mass. 800, Me. 220, Pa. 513, Wyo. 801.
 vitamin A assays of, sources of error in, 6.
 wax emulsions for retarding deterioration and reducing water losses, [N.Y.]Cornell 58.
 weevils spread by motor vehicles, 247.

Vegetation—*See also* Flora and Plant(s).

- of Colombia, 487.
- of Prince William Sound region, Alaska, 36.
- of southeastern Washington and Idaho, ecological study, 36.
- of western Kansas during seven years of drought, history, 36.
- on range land, composition, relation to cattle grazing, Nebr. 506.
- short-grass, methods of quadratting, comparison, 505.
- types in uncultivated areas, conditions determining, 485.

Vegetational areas, natural, in Texas, 32.

Venturia—

- acerina* n.sp., perfect stage of *Cladosporium humile*, 389.
- pirina*, heterothallism and variability in, 387.

Vertebrates—

- lower, digestion in, 471.
- productivity in populations, analysis, 544.

Verticillium—

- cinereus*, notes, 243.
- disease of greenhouse plants, [N.Y.] Cornell 67.
- sp. new on peppermint, Ind. 679.
- wilt of chrysanthemums, 243.

Vetch—

- varieties for soil improvement and seed production, Ala. 666.
- winter, as green manure, N.J. 342.

Viburnum bacterial leaf spot, U.S.D.A. 805.

Village, role in American rural society, 738.

Vinca—

- minor* stem canker and foot rot, U.S.D.A. 805.
- rosa*, apical meristem, effect of colchicine, 31.
- spp., results of colchicine treatments, 205.

Vines, toadstool root rot of, 542.

Vineyards, establishment and management, Iowa 220.

Violet—

- root rot of potatoes and sugar beets, U.S.D.A. 377.
- species, soil relations, 37.

Virginia creeper anthracnose, cause, 389.

Viroplasm hypothesis, studies, 379.

Virus(es)—

- * activity problem, physicochemical viewpoints for, 471.
- antagonism tests, limitations, 69.
- bacterial, 192.
- diseases of stone fruits, 81.
- genes, review, 208.
- inactivator from yeast, 530.
- mutation in, 44.
- Nomenclature, International Committee on, history, 530.
- propagating, use of developing chicken eggs for, Ill. 564.

Virus(es)—Continued.

- symptoms in leaves, darkening technic for inducing, 530.

Vitamin A—

- and carotene absorption by chickens, relation to lecithin, N.J. 403.
- and E, interaction, 891.
- and injected carotene, comparative physiologic value, 892.
- assays of plant tissues, sources of error in, 6.
- concentration by adsorption, 479.
- deficiency—
 - and urinary calculi in livestock, Colo. 851.
 - chronic, effect on bacterial flora of rats, 599.
 - in children and adults of Newfoundland and Labrador, 313.
 - in dairy cattle and carotene in blood plasma, 844.
 - measure of, 313.
 - ocular manifestations, detection by biomicroscopy, 742.
 - Pett visual test for, 145.

deficient diet of calves, pathology, 114.

deficient diet of rats, changes in structure of teeth on, 600.

determination, 6.

determination, Carr-Price reaction of carotenoids as source of error in, 479.

effect on gastric juice secretion in deficient hydrochloric acid production, 145.

human excretion of, 749.

in blood and liver of chicks, effect of ethyl alcohol and trichresol, 261.

in blood of children, 312.

in blood plasma of dairy calf, vitamin A intake requirement, 705.

in butter, feeding of cows to control, 105.

in butterfat, Ind. 616.

in milk, effect of levels of shark-liver oil in ration, Fla. 842.

in rat, effect of dibenzanthracene, of alcohol, and of other agents, 892.

intake, high, effect on blood and milk carotene of cows, 844.

noncrystallizable, 892.

photoelectric photometer for determination, 5, 6.

potency of fish oils, 138.

relation to animal diseases, 710.

requirements of chicks and layers, 261.

stability in cod-liver oil mixed with feed, effect of manganese sulfate, 555.

utilization, effect of α -tocopherol and unsaturated fatty acids, 698.

Vitamin B₁—*see also* Thiamin.

- as fertilizers, Tex. 225.
- assay, evaluation of fluorophotometers for, 620.
- at different soil temperatures, effect on gardenia chlorosis, Mass. 807.

Vitamin B₁—Continued.

deficiency—

and flour milling, 603.

blood pyruvate in, 315.

disease in foxes due to fish feeding, 571.

determination, 8.

determination, simple method, 479.

effect on growth of *Agrostis tenuis* and *Brassica alba*, 194.

effect on growth of rice, 195.

excretion, clinical studies, 315.

in foods and biological materials, determination, improved procedure for, 762.

in ophthalmology, 147.

in urine as determined chemically and biologically, 763.

in wheat, determination, modified thiochrome method, 8.

inactivation by raw fish, 702.

intake, low, possible adaptation to, 456.

intermediates, Mo. 145.

requirement of wax moth larvae, 401.

thiazole component, photochemistry of, 169.

Vitamin B₆—see also Pyridoxin.

chemical determination, 11.

colorimetric determination, 11.

deficiency in dog, 147.

effect on rat dermatitis, Mo. 147.

requirement of chick, 839.

Vitamin B complex—

added to diet of stabilized diabetic children, effect, 601.

and fat metabolism, 146.

deficiency, nonpellagrous eruptions due to, 147.

factors, all known, added to synthetic diet, inadequacy for mice, 749.

factors in Russet Burbank potatoes, Idaho 739.

group relation to seborrhea in man, 600.

group, round table discussion from standpoint of pediatrician, 312.

new factor requirement of mice, 456.

studies with mice, role of *p*-amino-benzoic acid in, 600.

Vitamin C—see also Ascorbic acid.

and sterility in horses, 97.

effect on workers exposed to lead dust, 318.

excretion and induced hypoprothrombinemia, 698.

in catsup, Mass. 760.

in Costa Rican fruits and vegetables, 458.

in Florida fruits and vegetables, Fla. 880.

in food crops, regional and varietal differences, Me. 303.

in fresh and canned fruit and vegetable juices, comparative costs, 457.

in milk, effect of cocoa on, Mass. 842.

in milk, effect of processing, [N.Y.] Cornell 104.

in peppers and significance as protective foods, 458.

in potatoes, 459, Mass. 605.

Vitamin C—Continued.

in potatoes, storage and cooking losses, Wyo. 880.

in sauerkraut and changes during storage, 459.

in soursop, P.R. 617.

in urine, determination, 481.

in Washington fruits and vegetables, Wash. 447.

in wild fruit products, 605.

intermittent consumption, effect of development of scurvy, 895.

nutrition in school children, 316, Me. 316.

potentiometric determination, 763.

round table discussion from standpoint of pediatrician, 312.

use of bacteria in chemical determination of, 623.

Vitamin D—

A. O. A. C. chick method of assay for, 16.

and Ertron, effect on serum calcium, 310.

assay procedure in chicks, modifications in, 839.

effect on incisor teeth of rachitic rats, 460.

massive doses, effect on vitamin K-deficient chicks, 560.

of shark-liver oil for poultry, Fla. 833.

preparations, economical purchase of, 460.

requirement of dairy cows, S. Dak. 563.

requirements of turkey poults, 562, Wash. 404.

requirements of turkeys, Pa. 554.

round table discussion from standpoint of pediatrician, 312.

spectroscopic method for estimation, 15.

stability in cod-liver oil mixed with feed, effect of manganese sulfate, 655.

supplements for poultry, Idaho 697.

uniform content in eggs, production, Iowa 256.

utilization by Jersey v. Holstein cattle, S. Dak. 563.

Vitamin E—

and A, interaction, 891.

and muscle degeneration in hamster, 698.

deficiency in guinea pig diet, causing death of embryo, 896.

distribution in cereal milling products, 154.

rations high in, for livestock and poultry, Iowa 257.

Vitamin G, see Riboflavin.

Vitamin H isolation from liver, 621.

Vitamin K—

and prevention of hemorrhagic disease in newborn infants, 155.

antepartum use for prevention of prothrombin deficiency in newborn, 156.

clinical studies in newborn infants, 155.

deficient diets, 155.

monograph, 461.

requirement of newborn infant, 607.

Vitamin K—Continued.

- round table discussion from standpoint of pediatrician, 312.
- storage and prothrombin levels in chicks, 561.
- studies, 461.

Vitamin K₁—

- colorimetric test for, 481.
- determination, method, 626.

Vitamin P and capillary fragility, 156.

Vitamin, antihemorrhagic, *see* Vitamin K.Vitamin, antineuritic, *see* Vitamin B₁.Vitamin, antirachitic, *see* Vitamin D.

Vitamin(s)—

- as fertilizers, Tex. 225.
- deficiencies in sugar beet molasses, Utah 259.
- deficiencies of *Ceratostomella*, 350.
- deficiencies, oral manifestations of, 890.
- deficiency diseases in subclinical stages, prevalence, 743.
- essential in livestock and poultry nutrition, 834.
- in dermatology, 600.
- in plants, effect of cultural treatment, Mo. 145.
- properties, functions in body, and sources, Okla. 749.
- requirements of older people, Mass. 880.
- requirements of rats, effect of exercise, Pa. 589.
- supplements, effect on growth of infants and incidence of rickets during first years, 607.
- tabulation and importance, Mo. 748.

Volutella, large-spored species causing stem and stolon canker of *Pachysandra*, N.J. 818.

Wall construction, concrete masonry, good practice in, 577.

Walnut(s)—

- blight control, 242, 388.
- decline and death in Oregon, causes, 242.
- growth, Iowa 220.
- hybrid, infertility in, 653.
- "mal de la tinta" in Argentina, 242.
- Persian, bacterial blight, U.S.D.A. 805.
- trunk canker, 242.
- varieties, N.Mex. 371.

War, effect on farm family, 609.

Washington Station notes, 468.

Washington Station report, 465.

Wasp parasite of coconut caterpillar, 403.

Water—

- and soil conservation, Fla. 768.
- bound, in colloidal systems, nature of, 474.
- conservation and flood control project, 278.
- conservation folders for farmers and ranchers, U.S.D.A. 639.
- conservation with stubble mulch, 122.
- control investigations, Fla. 769.
- culture, *see* Plant(s), culture.
- disposal planning technics, 860.
- drinking, and dental caries, 890.

Water—Continued.

- drinking, warming for livestock, electric heat for, Ind. 725.
- flow and distribution in soil, Iowa, 183.
- fluorine in, relation to well depth, Ariz. 760.
- fresh, *Clostridium kluyverii* isolated from, 349.
- ground, in upper Santa Cruz Valley, Ariz. 859.
- heavy, purified by distillation in high-vacuum line, pycnometer for, 474.
- hyacinth, toxic effect of chemicals on, 354.
- irrigation, *see* Irrigation water.
- mineral content, reduction with organic zeolites, 725.
- of Ohio, surface and underground, 574.
- pasture studies, Fla. 792.
- polluted, sterilization by ultraviolet rays, N.J. 428.
- red, from wells, cause and correction N.J. 428.
- resources of Ohio, conservation of, 574.
- rights in West, selected problems in law of, U.S.D.A. 292.
- studies, aid in planning for larger acreages of war-needed crops, Colo. 631.
- supplies, effect of ozonation on bacterial flora, Iowa 263.
- supply, forecasting, Ariz. 859.
- supply of United States, 120, 725.
- surfaces, measurement of evaporation from, U.S.D.A. 340.
- unfreezable, relation to cold-hardiness of insects, 821.
- vaporous, quantity in atmosphere, 630.
- warming for poultry, 278.
- wheels, overshot and current, Mont. 431.

Waterfowl—

- breeding areas, distribution and ecology of plants in, Iowa 191.
- food plants, value, propagation, and management, 86.
- in British Columbia, 391.

Watermelon(s)

- carotenoid and provitamin A content, 312.
- chemically induced parthenocarpy in, Mich. 223.
- disease-resistant strains, breeding and selection, Iowa 228.
- diseases, Fla. 806.
- Fusarium* wilt resistance, Tenn. 378.
- on sand, soil acidity for, 223.
- Pythium* spp. on, Mo. 67.
- rind toughness in, 60.
- seed, globulin of, protein nutritional studies, Conn.[New Haven] 760.
- variety tests, Del. 220, Iowa 220, Mo. 57.
- wilt resistance in F₁ hybrids, 79.
- wilt-resistant varieties, Wis. 528.
- wilt-resistant variety, developing, 67.

Watershed(s)—

- agricultural, subsurface water in hydrologic research on, 631.

Watershed(s)—Continued.

- and hydrologic studies on central Great Plains, 120.
- experimental, hydrologic data, U.S.D.A. 632.
- improvement programs, hydrologic evaluation, 429.
- Pecos, of New Mexico and Texas, infiltration studies, 187.

Wax moth larvae, vitamin requirement, 401.

Waxyntile, wood-decaying fungus of, 390.

Weather—*See also* Meteorological observations and Meteorology.

- and crop yields, U.S.D.A. 20.
- and its distribution, relation to corn yields, U.S.D.A. 340.
- factors, methods of computing regression of yield, Iowa 766.
- forecast project, long-range, 22.
- forecasting, 631.
- forecasting, daily, for Susquehanna River basin, 631.
- forecasts, comparison of methods, 181.
- forecasts, verifying, formula, 340.
- in 1941 and fruit diseases, 631.

Webworms, sod, ecology and control, Iowa 248.

Weed(s)—

- and shrubs, effect on weight gains of cattle grazing pastures, Colo. 258.
- control, N.Dak. 667.
- control by plant diseases, U.S.D.A. 680.
- control, dichloroethyl ether test for, Ky. 792.
- control implements, Ind. 725.
- control in growing corn, Iowa 863.
- control, selective sprays for, Oreg. 798.
- effect of burning off on yield of succeeding crops, Fla. 792.
- eradication in tame pastures, Fla. 792.
- germination and seedling growth form, 52.
- in grain, control by chemical sprays, Wis. 505.
- in Kansas, descriptions and control, 798.
- in lespedeza, control, Kans. 217.
- noxious, from Latin America, in United States, 348.
- of California and control, 57.
- problem in Utah, Utah 219.
- seeds, viability and germination, 512, Iowa 55.
- suspects of potato yellow dwarf virus, 75.
- trees, killing, ammonium sulfamate for, Mass. 800.

Weevil(s)—

- clay-colored, in British Columbia, 90.
- leaf-eating, on cultivated fruit trees in Great Britain, 400.

Weil's disease, distribution and diagnosis in man, dogs, and rodents, 112.

Wells and pumping machinery, Ariz. 859.

Wheat—

- activity and quality (Q_{10} and μ of catalase in, 489.
- adaptation to lowland soils and production methods, Mo. 213.
- and flour technology, 16.

Wheat—Continued.

- black stem rust control by barberry eradication, progress in, Iowa 228.
- breeding, Del. 212, Idaho 659, 679, Ill. 504, Ind. 659, Iowa 212, Mo. 52, N.Dak. 55, N.Mex. 366, Pa. 504, S.Dak. 504, Wash. 367.
- breeding for smut and rust resistance, Ariz. 791.
- bunt, *see* Wheat smut, stinking.
- combining, moisture as factor in, Pa. 504.
- culture tests, Wash. 367, Wyo. 793.
- damaged and sprouted, seed treatment for N.Dak. 195.
- date of seeding test, N.Mex. 366.
- dry-land foot rot, relation to seeding date, 219.
- effect of top dressing of N carriers and manure and efficiency of P carriers on, Ind. 659.
- einkorn, hereditary susceptibility to X-ray injury, 359.
- farms, dry land, organization and efficiency, Idaho 437.
- farms in southwestern Kansas, changes on, U.S.D.A. 293.
- fertilizer tests, Del. 212, Ind. 659, Wyo. 793.
- fields, sampling for quality and production, U.S.D.A. 442.
- flour, *see* Flour.
- foot rots, varietal resistance to, 233.
- from seed of different weight and origin, analysis of yield, N.Dak. 55.
- germ oil as supplement to poultry rations, specificity, Iowa 257.
- germ oil feeding, effect on reproduction in sheep, 97.
- germ, vitamin in, 146.
- germinating, amylase development in, effect of temperature, 489.
- growth and yield, effect of diseases, Idaho, 679.
- hessian fly resistance, variety nursery for studies, Ill. 546.
- hessian fly resistant varieties, Ind. 694, U.S.D.A. 88.
- immature, freezable water and oxygen respiration in, 492.
- improvement for Oklahoma, Okla. 219.
- improvement program, Okla. 511.
- inheritance of characters in, Ind. 659.
- inheritance of disease resistance, Wash. 367.
- insect pest survey, Iowa 247.
- insects bred from, 394.
- Kanred winter, rate and date of seedling, 219.
- kernel harvested at successive stages, chlorophyll, xanthophyll, and carotene in, 200.
- leaf rust—
 - epiphytotic, basis for prediction, U.S.D.A. 527.
 - in Oklahoma, U.S.D.A. 527.
 - in South Dakota, U.S.D.A. 680.

Wheat—Continued.

- leaves, changes in metabolism induced by powdery mildew, 814.
- lithium in, absorption, translocation, and fate of, 198.
- manuring systems, effect, Ind. 659.
- milling and baking quality, relation to test weight, 2.
- milling products, thiamin in, 604.
- nematode spread in South Carolina, U.S.D.A. 805.
- of western Canada, effect of rainfall on protein in, 182.
- pasture grazing and mineral blood picture, 100.
- phytic acid in, effect of cooking, 594.
- polyploidy studies, Mo. 52.
- prices received by farmers, S.Dak. 876.
- production in California, Calif. 511.
- properties, effect of moisture, 471.
- protein, effect of storage, 139.
- respiration, fermentation, and growth in, effect of oxygen, 202.
- Rival and Mindum, freezing injury, relation to moisture in, N.Dak. 197.
- root rot and scab resistance, Tenn. 378.
- root rot, *Fusarium* spp. associated with, pathogenicity, 687.
- rotation studies, Va. 793.
- rust-resistant, for Egypt, 233.
- rusts and wheat scald, 533.
- rusts in Japan, physiologic specialization, 72.
- smut resistance, variety tests for, 229.
- smut, stinking—
 - control, adjustment of Ceresan dosages in, Ill. 528.
 - varietal reaction to, 687.
 - varietal tests and effect of seeding dates, 528.
- spring, adaptability for Illinois, Ill. 55.
- spring, hard red, protein and quality in, relation to temperature and rainfall, N.Dak. 512.
- spring, varieties for North Central States, U.S.D.A. 511.
- spring, variety and seeding tests, Wis. 505.
- stem rust—
 - control, barberry eradication for U.S.D.A. 66.
 - damage by race 56, Ariz. 805.
 - on Marquis variety, effect, 233.
 - unusually virulent race in Peru, 688.
- storage in experimental farm-type bins, U.S.D.A. 864.
- stored, quality, factors affecting, Ill. 573.
- straw, buried, colonization by soil fungi, 382.
- supply, national, contribution of Great Plains to, U.S.D.A. 292.
- take-all and soil conditions, 382.
- take-all, microbiological and nutritional factors in, 688.
- testing plats, county, location, Okla. 370.
- thiamin and riboflavin in, 148.

Wheat—Continued.

- Tilletia* spp., new races of, Wash. 378.
 - time of planting tests, Me. 213.
 - translocation of food between vegetative organs and fruit in, U.S.D.A. 484.
 - varieties—
 - and classes, distribution in U. S. in 1939, U.S.D.A. 797.
 - from United States, classification, U.S.D.A. 667.
 - merits and limitations, N.Dak. 55.
 - studies, Mo. 214.
 - variability in reaction to physiologic races of *Tilletia* spp. 72.
 - variety, new, for western North Dakota, N.Dak. 219.
 - variety tests, Ariz. 791, Idaho 659, Ill. 504, Ind. 659, Iowa 212, Mo. 52, N.Mex. 366, Pa. 504, S.C. 367, S.Dak. 504, Wash. 367, Wyo. 793.
 - vitamin B₁ in, determination, 8.
 - Wabash, seedling resistance to leaf rust in, inheritance, Ind. 659.
 - winter—
 - grazing and mineral blood picture, 98.
 - hardiness, yielding ability, and milling and baking qualities, factors affecting, Ind. 659.
 - production, Colo. 511.
 - production, effect of terrace ridges on, 667.
 - rate and date of seeding, Colo. 511.
 - variety and seeding tests, Wis. 505.
 - world, survey and outlook, 734.
 - yellow spot disease, U.S.D.A. 680.
 - yields and outputs, cycles or random variability in, 584.
 - yields, effect of soil management and crop rotation, Idaho 659.
 - yields from new phosphate carriers, Ill. 482.
 - yields, relation to selling values of land in Palouse area, Idaho 729.
 - zinc deficiency in, symptoms, 810.
- Wheatgrass, crested—
- culture tests, Wyo. 793.
 - singly and mixed, feed efficiency, Wash. 404.
 - yield, effect of shelterbelt on, Wyo. 793.
- Whey, dried—
- as flush mash for poultry and source of riboflavin, Idaho 697.
 - in poultry rations, Wash. 404.
 - in ration of unthrifty dairy calves, S.C. 411.
- White ants, *see* Termite(s).
- White-fringed beetle, studies, U.S.D.A. 88.
- White grub(s)—
- control in turf, Ind. 694.
 - damage, relation to management, Ill. 546.
 - in bluegrass sod, Ky. 822.
 - in young hemlocks, control, 831.
 - on strawberries, control, [N.Y.]Cornell 94.
 - studies, Iowa 247, [N.Y.]Cornell 90.

White pine—

blister rust—

control, 543, Conn.[New Haven] 805, U.S.D.A. 66.

control, cooperative, Iowa 228.

infection on red currants, production of *Cronartium* sporidia on, 818.

growing on Yale forest, 677.

seedlings, nursery development, effect of stocking and seed, 678.

weevil, Conn.[New Haven] 822.

weevil, concentrated spray against, effectiveness, U.S.D.A. 88.

weevil control with concentrated sprays, 549.

White scours—

in calves, 272.

treatment and prevention with sulfaguanidine and succinyl sulfathiazole, 854.

treatment with sulfaguanidine, 422, 854, S.C. 422.

Whiteweed roots, reserve foods in, 646.

Wildlife—

coccidiosis in, 719.

of the range and rodents, interrelations, Calif. 694.

Wild-rye, Canada, strains, Iowa 212.

Windbreaks, *see* Shelterbelt(s).

Wine—

making from Malayapple, P.R.U. 800.

making, refrigeration in, 20.

making, use of pectic enzymes in, 20.

raw, ascorbic acid in, 894.

red, role of acetaldehyde in, 181.

Wire and wire products, atmospheric corrosion, Ind. 725.

Wire, atmospheric exposure tests, Iowa 277.

Wireworm(s)—

Acolus mellillus, life history, Ky. 831.

biological control, U.S.D.A. 88.

control, 253, Conn.[New Haven] 822.

injury and potato varieties, N.Dak. 696.

injury to potatoes, [N.Y.]Cornell 90.

injury to potatoes, crop rotations for, N.Dak. 95.

life cycle, variations in length, 247.

on field and garden crops, Me. 248.

parasites of, 253.

protecting melon plants from, 252.

studies, Fla. 822, Wash. 394.

Wiring, electrical, treatise, 866.

Wisconsin Station notes, 612.

Wisconsin Station report, 609.

Wisconsin University notes, 612.

Women—

college, nitrogen, calcium, and phosphorus intakes, 452.

college, nutritional status, relation to dietary habits, Iowa 303.

college, vitamin C nutritional status, Wash. 447.

in farm, textile mill, and garment plant work, levels of living, Miss. 321.

Women—Continued.

rural, improving occupational status, Miss. 321.

work clothes for, U.S.D.A. 897.

young, basal metabolism and heat loss at temperatures from 22° to 35° C., 307.

young, calcium, phosphorus, iron, and nitrogen metabolism and requirement, Nebr. 746.

young, iron metabolism and requirement, Nebr. 747.

Wood(s)—*see also* Timber.

and wood-using industries of Missouri, Mo. 227.

dead, new yellow *Lepiota* from, 487.

decay, control, bibliography, 390.

decay, rate of, effect of addition of sugar on, 544.

fuel, used in United States, U.S.D.A. 227.

products, creosoted, *Hormodendrum resinace* on, 819.

Woodchuck control, Ind. 694.

Woodcock protection by reduction of open season, Pa. 546.

Woodland products, marketing of Indiana, Ind. 676.

Woodlot management, Ind. 676.

Woodpecker, pileated, habits in Maryland, 391.

Woody plants—

damping-off and growth of seedlings and cuttings, Mass. 806.

mineral nutrition on Tama, Lindley, and Clarion subsoils, 226.

utilized by deer only in winter, Pa. 546.

Wool—

and part wool fabrics, effect of wear on, S. Dak. 608.

density samples, clipper for obtaining, 101.

external physical characteristics, 97.

fiber, microscopic structure, 157.

fibrous protein, role of cystine in structure, 157.

improvement of resistance to moths, bacteria, molds, etc., 463.

keratin oxidation by potassium dichromate, 319.

keratin oxidation by potassium permanganate, 157.

marketing, cooperative, in Kentucky, Ky. 875.

scoured, variations in quantity and relation to price, Wyo. 834.

Wyoming Station notes, 468.

Wyoming Station report, 899.

Xanthine oxidase activity of rat liver and riboflavin deficiency, 457.

Xanthium pennsylvanicum, staminate inflorescences, development, effect of nutrition and age on rate, 41.

Xanthomonas, lipolytic activity, 809.

Xanthophyll in wheat harvested at successive stages, 200.

Xeromorphy and disease resistance in plants, 31.

- Xestobium rufovillosum*, duration of larval stage, relation of nitrogen metabolism, 400.
 X-ray diffraction films, accurate measurement, 170.
Xylaria apiculata on potato, Fla. 806.
 Yarn strength, theoretical approach to problem, 319.
Yautia variety tests, P.R.U. 213.
 Yeast(s)—
 alcohol tolerance, 35.
 alcoholic fermentation by, lactic acid formation in, 473.
 as supplement for pigs, 406.
 cells, ultraviolet injured, proliferation-promoting extract from, comparative growth studies on, 778.
 melibiose-fermenting, detection, 33.
 osmophilic, growth factor requirements, 33.
 polypeptidase, isolation and properties, 108.
 preparation active in breaking rest period of buds, 39.
 preserving and germicidal action of sugars and organic acids on, 18.
 pure-culture distillery, continuous process for production, 34.
 response to five growth factors, 33.
 staining with acid dyes, 630.
 total respiration, effect of ethyl carbamate, 201.
 virus inactivator from, 530.
 Youth, rural—
 and Government recreation program, 588.
 in Indiana, Ind. 588.
 Youth, rural—Continued.
 in Massachusetts, Mass. 301.
 in Virginia, Va. 302.
 problems, Minn. 445.
Yucca, economic value, Ariz. 791.
Zanclognatha minoralis larvae, new descriptions, 400.
Zanthoxylum americanum, chromosome number, 360.
Zebu calves, resistance to tuberculosis in Uganda, 114.
Zetta vertebrata, parasite of horned passalus, 553.
 Zinc—
 deficiency in rat diet, histological studies of tissues of, 597.
 deficiency in wheat and flax, symptoms, 810.
 feeding to pigs, 856.
 fungicides, mechanism of action, 380.
 in fungicidal sprays, substitutes for, 231.
 in New Jersey soils and need for, N.J. 342.
 relation to seed production in crops, 640.
 sulfate on plants, effect, 37.
 toxicity in intensively cultivated areas, [N.Y.] Cornell 23.
Zinnia leaf spot and mildew, Fla. 806.
 Zoology, medical and veterinary, index catalog, U.S.D.A. 850.
Zoopage thamnospira, notes, 530.
Zygosaccharomyces—
 nectarophilus n.sp. description, 487.
 rugosus n.sp., description, 487.
 spp. causing date spoilage, 523.

I. A. R. I. 75.

IMPERIAL AGRICULTURAL RESEARCH
INSTITUTE LIBRARY
NEW DELHI.

[illegible]